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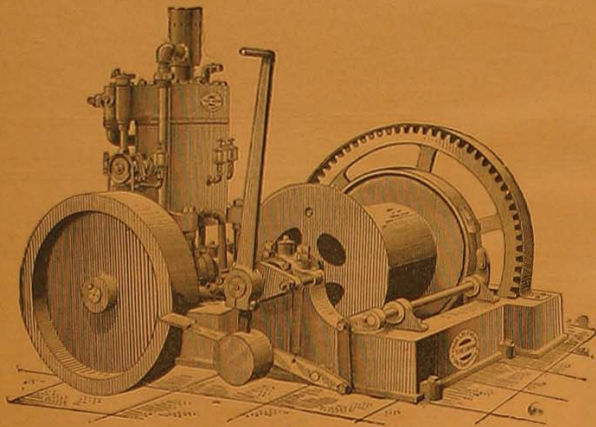
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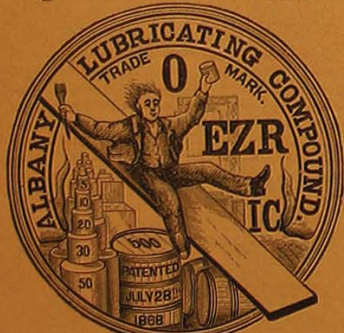
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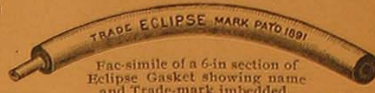
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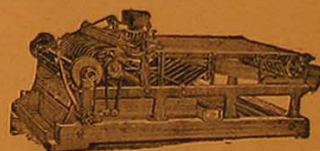
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A		E		L		S	
Abbott, W. O.	23	Elmer & Amend	4	Lambert Hoisting Engine Co.	32	Santa Fe Route	22
Aetna Powder Co.	4	Ellis, H. R.	27	Leffel & Co., James	28	San Francisco Lumber Co.	2
Agramonte, C. H. M.	21	Emmanuel, Wm. H.	2	Lexow, Theo.	17	S. F. Pioneer Screen Works	29
Ainsworth, Wm.	24	Eynon-Evans Manufacturing Co.	26	Lidgerwood Manufacturing Co.	21	Selby Smelting & Lead Co.	23
Albuquerque Foundry & Machine Works	24			Loneragan & Calkins	5	Simonds & Wainwright	30
Allis Co., Edward P.	1			Lord, Geo. W.	5	Silver City Reduction Works	27
Altender & Sons, Theo.	21			Luitwiler, S. W.	25	Smith, S. J.	17
American Diamond Rock Drill Co.	3					Smith & Irving	6
American Zinc Lead Co.	19					Smith & Co., Francis	2
Aubury, L. E.	19					Smith & Thompson	25
B		F		M		T	
Bailey, A. A.	24	Fauth & Co.	27	Machinery and Electrical Co.	29	Taylor & Co., John	27
Baker & Adamson Chemical Co.	18	Fay & Egan Co., J. A.	5	Masters, J. H.	17	Taylor Iron and Steel Co.	6
Baker & Co.	3	Ferrari, Guido	28	Mathison & Co.	23	Thomson & Boyle	2
Baker & Hamilton	22	Foote, Dr. A. E.	17	McDearmon & Co.	2	Tomlinson, J. B.	5
Baker Iron Works	32	Fowler, G. C.	30	Merrill, William B. & Co.	2	Townsend Bros.	2
Baird & Co., Henry Carey	21	Fulton Engine Works	27	Moller, E. C.	21	Remaine & Froehlich	21
Barnes & Co., W. F. and John	1	Fraser & Chalmers	32	Montgomery Machinery Co., J. H.	24	Trenton Iron Co., The	24
Beam, J. Willard	21	Frese, Adolf	18	Moore & Co. Chas C.	4	Troemner, Henry	24
Beeley & Co., A. J.	17	Frue Vanning Machine Co.	30			Trux Manufacturing Co.	5
Bell, Newton M.	21						
Bi Metallic Assay Office	22	G		N		U	
Bickford Drill Co.	28	Garratt & Co., W. T.	27	National Iron Works	5	Union Gas Engine Co.	2
Bickford Drill Co.	28	Gates Iron Works	25	National Pipe Bending Co.	26	Union Hardware & Metal Co.	22
Blake Mfg Co., Geo. F.	4	Giant Powder Co., Con	28	New Haven Mfg Co.	25		
Borden, Gail	4	Glandig Co., James	22			V	
Boothe & Co., C. B.	31	Globe Iron Works	22			Van Der Naillen, A.	5
Bradley-Ramsey Lumber Co.	32	Goodyear Rubber Mfg Co.	4			Van Nostrand Co., D.	18
Bradley Pulverizer Co.	21	Graphite Lubricating Co.	18			Voll, C. H.	18
Brandis & Son, F. E.	22	Grimwood, Chas P.	18			W	
Brown, M. E., Home F.	30	Gutta Percha Rubber and Mfg Co.	23			Wade & Wade	18
Brownell, James S.	30	H				Warren, A. A.	38
Buff & Berger	22	Hamlin & Morrison	27			Washington Machinery Depot	2
Bullock Mfg Co., M. C.	27	Hassell Iron Wks Co.	22			Watson, R. N.	32
Burbridge, S. L.	30	Harrington & King Perforating Co.	24			Weber Gas and Gasoline Engine Co.	3
Burlingame, E. E.	30	Harper & Reynolds Co.	24			Weber & Co., F.	27
Burlingham, N. D., M. E.	24	Heckelmann and McCann	1			Weigle Pipe Works	27
		Hercules Gas Engine	17			Western Chemical Co.	19
C		Hendy Machine Works, Joshua	25 & 32			Western Forge & Rolling Mills	25
Caldwell Bros	21	Hendrie & Bolthoff Manufacturing Co.	28			Whitney Co.	23
Cal Bellows Mfg Co.	24	Henley & Co., Norman W.	2			White Rogers & Co.	27
California Perforating Screen Co.	25	Henshaw, Bulkeley & Co.	5, 22, 23, 24, 25, 26, 28			Wigmore & Sons Co., J.	3
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Coates, H. P. G.	30	Hunt, Fred. F.	6			Woodward, E. C.	25
Colburn, Richard L.	2	I				Y	
Colorado Iron Works	23	Imperial Chemical Co.	22			Yawger, I. C.	21
Cook's Sons, Adam	2	Incorporated Mines Paying Dividends	30				
Colo. and Cal. Mineral Development Co.	26	Ingersoll, Sergeant Drill Co.	19				
Company Industrial Mexicana	28	J					
Conway & Co., F. J.	4	Jackson Drill and Manufacturing Co., The	26				
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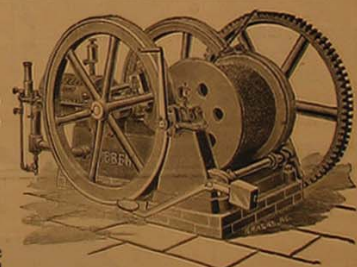
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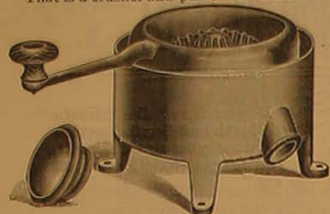
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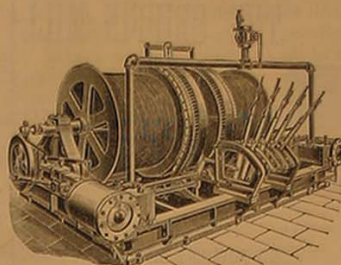
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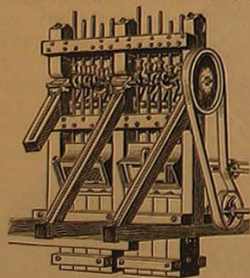
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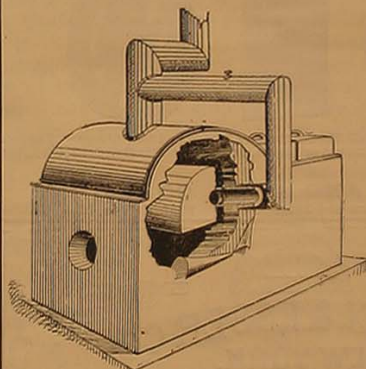
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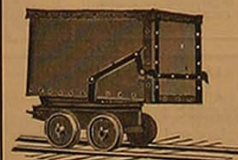
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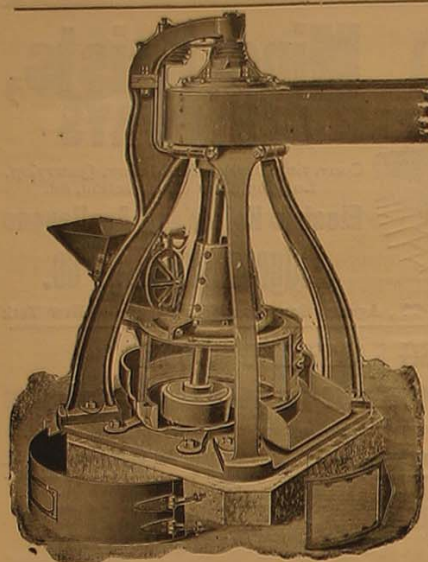
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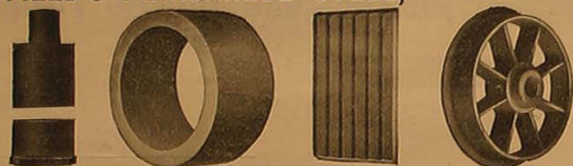
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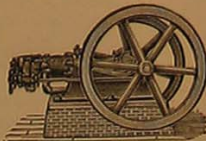
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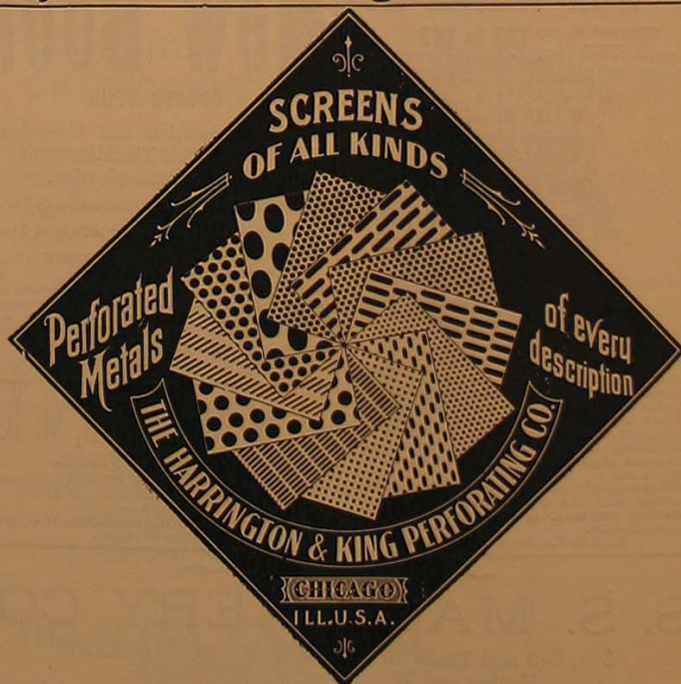


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shaft house or hoisting works most convenient to the shaft or tunnel. A working plan of the shaft and each level of the mine can be made by taking two sheets of plate glass, which are supposed to represent the vein, and ought to be placed at the angle of the dip of the lode, and by painting on the glass with oil paint and the use of small pieces of wood, to represent timbers placed in the mine. A correct model of the shaft and level represented can be made, which can be colored to indicate the ground stoped, timbered, filled with refuse, as well as the ground unworked, with ore shoots or chimneys indicated, and so also with each succeeding level of the mine. By using sheets of plate glass of sufficient size, any desired scale can be made, and by the placing of the two sheets at the required distance apart from each other, a good model of the workings can be made.

Such a plan is of great service to the manager or foreman in giving instructions to the miners or timbermen, and in giving the employees a clear understanding of the location of the ore bodies and correct position of the workings.

KLONDIKE FAILURES.

As predicted in these columns in former issues, the return to the United States of many who went to the North Western gold fields some months ago, with ruined constitutions, and without the fortune, or often without their outfit and penniless, are evidences of the truth and sincerity of our warning remarks which were not heeded. If this suffering came on those alone who went there it would not be so severe, but when it falls to the lot of widows and orphans, the Klondike craze will have cost as much money and lost as many lives, in proportion to those engaged, as has the present war with Spain, and the gain will be as great to the general interests of the country.

THE WAR TAX ON STOCKS.

If this tax has the effect of weeding out all stock gambling operations in bogus mining ventures, which have their existence mostly on paper, and on which the location of the supposed mine itself has been known to change from one prospect claim to another a few miles off, as in the case of one notorious fake mining enterprise of recent date, it will have accomplished one good and in aiding those who staid at home, as well as adding power to the sinews of war. The mining industry can well afford to pay its share to the cause of liberty and justice to the oppressed colonial subjects of Spain, especially if that will increase the mineral area and foreign trade of the United States, of which the miners will get their share, and it may also help in giving additional territory to prospect, develop and supply with machinery, in place of our people going to seek misery and misfortune in the inhospitable northern wilderness.

SOME REMARKS ON THE CYANIDE PROCESS.

(Continued from July 15th issue.)

There is no more doubt that an ore crushed to as even a size as possible is much better leachable than an ore crushed into various sizes. Even a very finely powdered silicious ore can be leached successfully, if the size of the very small particles is more of an even

size. Ores crushed to different sizes do not leach so well, because the minimum particles will always fill out the minimum spaces left between the coarser particles, and render it, therefore, much more difficult for the solution to penetrate and come in contact with the gold-bearing particles of the ore.

On the Crown Reef mine, one of the best managed mines on the Rand, for instance, the ore is separated into two sizes and slimes, by means of Spitzkasten, after leaving the plates. Each size is collected in a different leaching vat and treated by itself. The extractions are very good, as shown by the following figures:

In February, 1895, 16,056 tons of ore were treated. 59.721 per cent pure gold of the assay value of the ore were recovered over the plates. The first size, being the coarser and more pyritic ore, amounted to 1057 tons. The residue of this size assayed 1.5 dwts per ton, after treatment by cyanide, and the amount of this gold recovered, 7.578 per cent of the assay value of the ore.

The second size, being the finer and more sandy ore, amounted to 10,152 tons, (residues assaying 0.87 dwt per ton, after treatment with cyanide,) fine gold recovered 17.829 per cent of the assay value of the ore. Slimes amounted to 4,847 tons, assaying 3.07 dwts per ton.

This gives a total actual extraction of 85.128 per cent on the assay value of the ore, and a loss of 14.878 per cent, of which however 8.687 per cent were contained in the slimes, of which again about 85 per cent were recovered by a process worked out and introduced by Mr. Williams; so that there was an actual loss of only about 7 per cent of the fine gold contained in the ore, or about 1.5 dwt per ton of ore.

Before referring now to the above-mentioned so called double treatment, I should like to quote a remark made by Mr. McArthur, at a meeting of the Society of Chemical Industry in 1890:

"Elsner has stated metallic gold dissolves in cyanide of potassium only in presence of oxygen. Not having seen the original account of Elsner's researches, I am not in the position to criticise his experiments, but I never could find that the presence of oxygen was necessary either to dissolve gold by itself or from ores by cyanide. If a piece of gold be immersed in a cyanide solution, so that air to act on it would have to penetrate two inches or three inches of the solution, the gold will dissolve in its usual slow and steady fashion. The equation shows that either oxygen must be absorbed or hydrogen evolved. I have seen no evidence of the former, and can adduce no proof for the latter; but I think the latter the more probable, because I cannot conceive oxygen penetrating even a film of cyanide solution without at once oxidizing the cyanide to cyanate, whereas in the other case, as suggested to me by my friend Mr. Ellis, the nascent hydrogen may be at once seized by the excess of cyanide present and ammoniacal compounds formed. However, we do not concern ourselves much with the reactions of pure gold, but as a matter of fact we cannot find that oxygen plays any part in the cyanide extraction of gold from ores. We have treated an ore with cyanide with free access of air, and then a parallel experiment was done with boiled water, the bottle filled to the stopper with solution and ore, and the stopper sealed. The extraction was the same in both cases."

Today no chemist is in doubt any more that Elsner's formula is correct, and that the

presence of oxygen is absolutely necessary for dissolving gold by cyanide. That this is so was proven by many experiments, of which I will mention one as a very striking one:

Take two small pieces of filter paper, put equal parts of precipitated fine gold in powder form on each of them. Make up a very dilute solution of cyanide into two beakers. Take one of the filter papers with the gold on it and put it in one of the beakers, but so that it floats on the surface of the solution only. Take the other filter paper with the gold on it and bring it into the second beaker, but so that it is covered by the solution at once. Allow it to settle to the bottom of the beaker, and if it does not do this by its own gravity, assist with a glass rod.

You will notice that the gold on the first filter paper will be dissolved in a few seconds, on account of the cyanide solution coming in contact only from below, while the gold itself is exposed to the oxygen of the air. The gold on the second filter paper, which lies at the bottom of the beaker, and which is perfectly covered by the solution, therefore not being able to come in direct contact with the oxygen of the air, requires hours before it becomes dissolved.

The practical confirmation of Elsner's theory has led to the so-called double treatment, which in fact is nothing but an oxidation process, in which oxygen of the air takes the part of an oxidizing agent.

To apply the double treatment, two leaching vats are placed above one another, so that the contents of the upper one can be easily discharged into the lower one, by means of Butter's patented bottom discharge. After the ore is charged into the upper vat, it is moistened with a dilute cyanide solution. After several hours the ore is discharged into the lower vat. By doing so, the ore moistened with the cyanide solution cannot help coming in contact with the oxygen of the air.

The practical result is that the first leaching, followed with a very weak cyanide solution in the second vat, gives the second solution by far the largest percentage of the gold contained in the ore solution. Practically, the formation of the double salt, gold cyanide potassium, had already taken place, and it requires only several washes with a very weak solution to extract the yellow metal.

Free milling sandy tailings do not require a double treatment. The oxygen of the air brought into contact with the ore at the same time with the solutions is sufficient in these cases.

The double treatment has been worked with very good results on pyritic tailings, and I do not see why it should not work well with a low grade pyritic ore as well.

In cases in which the gold contained in the ore is not very readily acted upon by cyanide, a so called artificial oxidation may be applied with success. Experiments have proven that an addition of oxidizing chemicals accelerates the solution of the gold considerably. There can be no doubt that the oxidizing qualities of for instance permanganate of potash, ferri cyanide of potash, peroxide of sodium and other oxidizing chemicals may be of great advantage in extracting gold from pyrites and refractory low grade ores. It is certainly worth while in cases in which refractory ore is not tractable with success to make experiments in this line under the directions of a good and competent metallurgist.

I have perfect confidence that the extraction of gold from ores by cyanide will increase in this country for a good many years

to come, and that many lowgrade gold ore deposits, which were regarded as not payable heretofore, will become possible to be developed and worked successfully by the cyanide process, the process by which it became possible to increase the gold output of the whole world considerably, and which is one of the reasons that the United States take the lead today of all gold-producing countries, and which let us hope will be the case for many years to come, to the certain prosperity and high commercial standing our country takes today amongst the countries of the whole world.

To give a very good example in order to show how important this question of crushing the ore to its proper size for leaching purposes with Cyanide solution is, I only need refer to what occurred some years ago at the now world renowned Mercur Mine, not very many miles away from here. At that time, six to seven years ago, the former managers of this mine and Cyanide extraction plant, which by the way, was the very first plant for treating ore in this country by the so-called direct Cyanide process, were advised to grind the ore to a size of about 600 mesh in order to attain the highest possible extraction. The result was an extraction of only about 40 per cent of the assay value of the ore. This for some time proved quite a puzzle and was of great trouble to the managers. After many and not very successful experiments had been gone through, it was decided not to crush the ore so fine on account of the porous nature of the ore and its considerable percentage of Talc and Alumina, which latter of course rendered the ore rather impenetrable for the Cyanide solution. The results were, that the coarser the ore was crushed the higher the extraction became, and today, while the ore is crushed only to the size of about $\frac{1}{4}$ -inch square, one of the highest extractions known, about 85 per cent of the assay value of the ore, assaying on the average 15 to 18 dwts. per ton is gained.

During my last stay on the Rand in 1895 to 1896 I had the opportunity to convince myself that the classification and separation of the ores, according to size and specific gravity, before the treatment with Cyanide, was a great success. On my visit to the Transvaal in 1895 three processes were in use to recover gold from ore. First, Amalgamation over copper plates, by which most of the free milling ore was recovered (about 50 per cent of the assay value).

Second, subsequent chlorination of the concentrates from Frue vanners, and

Third, Cyaniding of the remaining tailings.

In 1897 the total output of the mines on the Rand amounted to over three million ounces fine gold, of which one-third, say one million ounces, were recovered by the Cyanide process. That the amount of gold recovered by Cyanide has increased so considerably during the last years and that the Cyanide process has become quite a strong competitor to the chlorination process on the Rand is mostly due,

First, to the above-mentioned classification of the ore, and

Secondly, to the so-called double treatment of the ore.

I thought it well to say a few words about these two processes as in some cases they may be applied with advantage in this country. They may either help to increase the extraction or may lead to the successful treatment of ores which were not treatable before. On the Rand it was proven that,

First, a decided separation of the sandy ore from the slimes is necessary in order to obtain a good extraction.

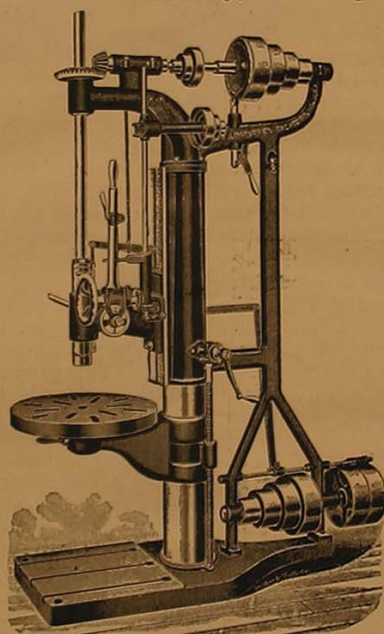
Secondly, that by classifying a concentrated ore into different groups of different sizes and specific gravity a much higher extraction is gained.

This separation and classification of the ore is done by passing the ore as it comes from the plates through a system of so-called Spitzluten and Spitzkasten, apparatuses well known to all of you and which I therefore do not think necessary to describe in detail.

(To be continued.)

Barnes' Upright Drill.

A new drill, which W. F. & John Barnes Co., of 105 Ruby street, Rochford, Ill., has just built and are placing on the market, is the Barnes Upright Drill, No. 5, with 26 inch swing. It was produced in response to a very general inquiry for a sliding-head drill smaller than their 28 inch drill and it is thought this new machine will meet fully the requirements for a drill intermediate in size and capacity between the 25 inch stationary head drill and the 28 inch and 34 inch sliding head



BARNES' NO. 5 UPRIGHT DRILL.

drills. This new machine has been designed with special care, and it is believed to embody every feature necessary to make it a complete and perfect tool. The workmanship is thoroughly first-class in every respect.

The feed arrangement is specially strong, and provides for all the different feeds which can be used on a drill press. The cut shows very clearly the feed mechanism, and, as will be seen, the drill has power self feed with automatic stop, lever and worm feed, and quick return for spindle. The feature of hand lever feed on a sliding head drill, in combination with worm and power feed, is new and increases the usefulness of the drill. The spindle is fitted with the No. 3 Morse taper.

The dimensions are as follows:

Height of drill.....	7 ft.
Greatest distance from spindle to base..	53 in.
Minimum.....	21 in.
Diameter of column.....	7 in.
Diameter of spindle.....	1 11-16 in.
Width of column face.....	6 in.
Travel of sliding head.....	21 in.

Travel of spindle.....	11 in.
Diameter of large pulley on cone.....	10 in.
Diameter of small pulley on cone.....	4 in.
Face of pulleys.....	3 in.
Tight and loose pulleys.....	10x3 in.
Diameter of crown gear.....	7 3/4 in.
Diameter of bevel pinion.....	3 3/4 in.
Face of tooth.....	1 3/4 in.
Ratio of back gearing.....	5 1/2 to 1.
Required floor space.....	21x52 in.
Weight.....	1350 lbs.

In our issue of July 15th, on page 8, in our review of the second edition of *Gas, Gasoline and Oil Engines*, by G. D. Hiscox, we neglected to give price of same, which is \$250. The publishers, Messrs. Norman W. Henley & Co., of 132 Nassau street, New York City, will forward the book to anyone on receipt of price.

The Consolidated Kansas City Smelting and Refining Company have met with phenomenal success in marketing their new bi-product, the Alchemist brand of blue vitriol. In November of last year they improved their copper plant in many ways, increasing their capacity to 550 tons of blue vitriol per month.

The present year was started under the most auspicious circumstances, as they were awarded the entire contract for the consumption of the Western Union Telegraph Co. A good market has been found in the East, Old Mexico and Canada. Several shipments have also been made to the Mediterranean coast. The Alchemist brand of blue vitriol is put on the market in the form of large and small crystals. Its great popularity is due to the high percentage of copper, and to the almost entire absence of impurities.

The Colorado Iron Works Company are working their plant to its full capacity, and making shipments to nearly all parts of the world. Among recent shipments were two 42x144 silver-lead smelting furnaces, with complete smelting equipment, to the Tasmanian Smelting Company, located on the Island of Tasmania. This order filled six cars. This company is also building a 42x144 silver-lead smelting furnace, for the Hanauer Smelting Company, of Utah; and a 45x144 silver-lead smelting furnace, for the Germania Lead Works, Salt Lake City, Utah; both with complete smelting equipments. A large jacket smelting furnace for the Canadian Pacific R. R., British Columbia; one for the Great National Mexican Central Smelting Company, Old Mexico, and one for the Mountain Copper Company, in California.

This firm has established a reputation for its smelting furnaces because of superior design, workmanship and material, which brings orders from all over the world.

The name of the crude mill for crushing ore, the correct orthography of which is "arastre," is written and pronounced in many different ways, some of them amusing. The senior editor of the *Transcript* once wrote a letter for publication in the east, from a mining camp in the Death Valley region, in which he mentioned a "raster." He got the name by ear, from an experienced miner, and being a hundred miles from any kind of written authority, so wrote it.—*San Bernardino Transcript*.

While *The Transcript* devotes considerable space to mining news, and furnishes some first class mining literature, it is apt to be mistaken. If the senior editor of *The Transcript* will look farther into the matter, he will find that he has not spelt the word rightly as yet.

THE PROVO-MERCUR 40,000 VOLT TRANSMISSION.*

BY LEON W. BLY.

But few, even in the electrical transmission fraternity, are aware of the fact that the highest voltage employed in the commercial transmission of power over a long distance is that which is now operated on the lines of the Telluride Power Transmission Company between Provo canyon and Mercur, Utah. The Telluride people are pioneers in the field of extremely high voltage transmission and for several years have experimented conjointly with the Westinghouse Electric and Manufacturing Company, on transmission lines with potentials ranging as high as 120,000 volts.

The line used for carrying out these experiments was a special one extending from the Telluride Company's power house near Ames, Colorado, to the Gold King mine and having a length of 11,720 feet. The route of this line was over a rugged country subject to a heavy fall of snow in winter and rain with severe lightning in the summer. The poles were placed one hundred and eighty feet apart and supported three circuits of No. 8 galvanized iron wire. Practically all the different varieties of cross arms, pins and insulators to be found on the market were tested, as were also many new models of these appliances, devised at the time, and during the test runs, the condition of the atmosphere and of the line in regard to snow, rain and humidity were carefully noted. Up to the present, the results of these important experiments are reserved and every effort to secure the data deduced has been unavailing.

Reverting to the Provo-Mercur transmission, the plans of the Telluride company contemplate the early installation of two thousand and horse power in two units of 750 kilowatts each, to furnish power and lights to the mining interests in and about Mercur and Tintic, Utah. These two districts, which are perhaps twenty miles apart, are respectively thirty-two and forty-six miles from Provo Canyon, where the power house is located.

*Journal of Electricity.

The Provo-Mercur transmission line is the one which has been placed in operation, but work has been commenced on the construction of the independent line from Provo Canyon to the Tintic district, which will be, as stated, forty-six miles in length. After the Provo-Tintic line is completed, the substations at Mercur and Tintic will be connected together by a subsidiary transmission line so that in case of accident to either main line from Provo, service may be continued without interruption to both places. Immunity from pole line trouble seems to be perfectly secure by this arrangement as the two pole lines takes entirely different routes.

At present, one 750 kw. type "A. P." three phase General Electric generator is being operated by a flexible connection to a turbine wheel driven under a head of 125 feet and running at 300 revolutions, the turbine being temporarily hand-regulated. This generator has a periodicity of sixty cycles, is star wound, and gives a phase potential of 800 volts. Of the four 250 kw. raising transformers installed in the generating station, but three are in use, the remaining one being as reserve, and its connections are so arranged

that it can be substituted in service for either of the other transformers at a moment's notice. The normal primary potential applied to the raising transformers is 462 volts, the normal secondary being 23,100 volts. As is the case with the primaries, the secondaries are connected in star, hence the three-phase high tension terminals have a phase pressure of 40,000 volts.

The principal material



BREAK SWITCH FOR 40,000 VOLTS ON THE PROVO-MERCUR TRANSMISSION.

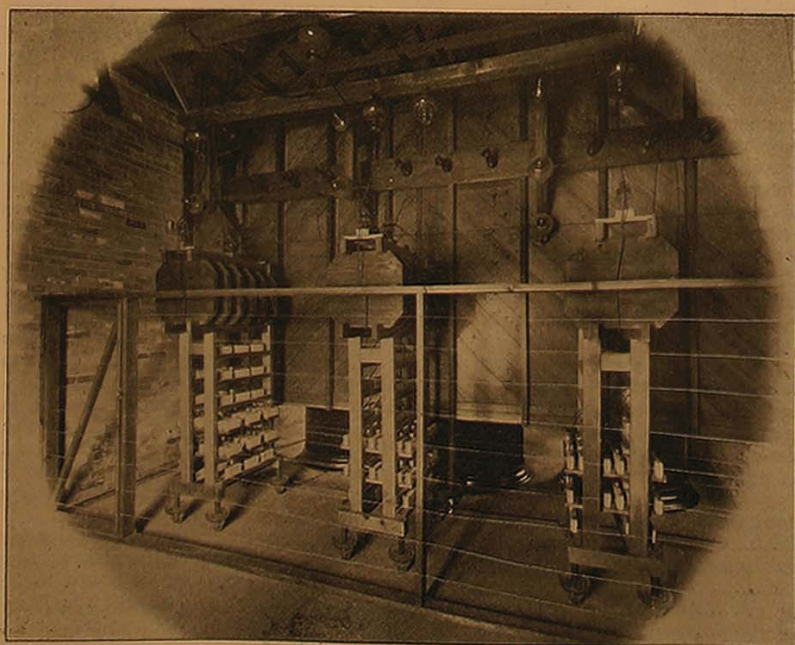
used in the insulation of these high tension transformers is muslin and fullerboard, blocks of maple wood being used to separate the coils. The transformer cores and coils are immersed in mineral seal oil, with no other cooling device than that of the natural radiation of heat from the surfaces of their cases. This radiation is, however, very great because of the fact that the surfaces of the cases are rather deeply corrugated. To be exact, the corrugations are $2\frac{1}{2}$ inches deep and one inch wide. The general appearance of the high tension transformers is shown in the illustration appearing on page 11, which also shows plainly the method of supporting the interior high pressure circuits.

The high tension leads are brought out of the tops of the tanks through walnut bushings, on the inside of each of which is a heavy porcelain tube extending from the top of the bushing down into the tank beneath the surface of the oil. The low tension leads are brought out at the sides of the tanks and these low tension leads consist of two series of twenty-eight turns in multiple of two three-quarters inch by 349 mils strap copper. The high tension windings consist of 1400 of No. 9 magnet wire. These transformers, as well as the lowering transformers at the Mercur sub station, were built by the Wagner Electric and Manufacturing Company of St. Louis, Mo., upon the designs and specifications of the Telluride Power Transmission Company.

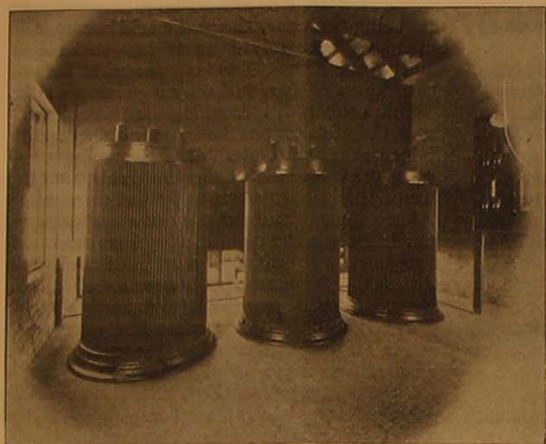
Tests made by the writer show the copper loss of the transformers to average about 2150 watts; the iron loss is about 3030 watts; the normal temperature at full load is 118 degrees above that of the surrounding air.

Three phase generation, three phase transmission and two phase distribution constitutes the scheme of the polyphase equipment, and all the three phase portions are star connected and the common center or neutral point of the star is grounded as will be described later. The line is protected by the Wurts non-arcing lightning arresters.

The line, which is carried on 35-foot cedar poles placed 125 feet apart, is of No. 5 B. & S., medium hard drawn copper, supported so as to form the points of an equilateral triangle



FUSES, CHOKE COILS AND LIGHTNING ARRESTERS ON THE PROVO-MERCUR TRANSMISSION.



THE 40,000 VOLT TRANSFORMERS.

having six-foot sides. One of the three wires is placed on top of the pole and the remaining two are run on the respective insulators of a seven-foot cross arm with a separation of six feet between the pins. The wires are not transposed, and a metallic telephone circuit is carried on brackets at a distance of 42 inches below the cross arm.

The insulators are of a special type of triple petticoat glass, having two corrugations around the top below the groove designed to carry the line wire. This arrangement not only has the advantage of increasing the surface of the glass between the wire and pin, but it also protects a portion of the surface from extreme moisture during rain storms. The approximate dimensions of the insulator are $6\frac{1}{2}$ inches across the base by 6 inches high, and the insulator is supported by a specially long locust pin made proof against moisture by being boiled in paraffine. Great care was taken to fill the pores of the wood thoroughly, to effect which the pins were kept in the tank in which they had been boiled until they had become thoroughly cooled, after which the surplus wax was removed and the surface of the pin was made smooth by dipping it again in very hot paraffine wax. These pins, being extra long, supported the insulator clear of the cross arm by five inches and the pin used at the top of the pole is two inches longer still, making the separation between the top insulator and the pole to be seven inches.

It appears obvious that an insulator of this design will offer a high resistance to a discharge over its surface, but should it be assumed that it could reach the lower edge of the outside petticoat, there would be little inducement for it to go further as the pin is at all times a good insulator and its surface is of such a nature that a film of moisture will not collect over it. On several occasions insulators have been shattered by marksmen, but it has been the experience that if trouble developed, owing to the grounding of the wire on the pin or cross arm, it would promptly rectify itself by the burning off of the cross arm, leaving the wire without support at that pole.

It will be interesting to note that at each pole along the line one can hear crackling from static discharges at all times, and during certain atmospheric condition the insulators are dimly luminous with pale phosphorescence. The

line itself, however, is non-luminous at all times except for the brush discharges which sometimes exist from points of the line, such as from the tips of the tie wires.

The lightning arresters, as before stated, are of the Wurts type. About twenty-five arresters being kept between the line and the ground. Six choke coils are used, and these are placed edgewise on top of the arrester racks, and as the latter are designed to be as compact as possible, they measure over all but two feet, by $3\frac{1}{2}$ feet, by 7 feet high. One of these banks of lightning arresters and choke coils are connected in each line wire as shown in the illustration.

To be more explicit, the connections of the lightning arresters are arranged as follows: Six choke coils are coupled in series and cut into the line after leaving the transformers. For convenience, we will here designate the choke coils by numerals consecutively, coil number 1 being at the left and being connected direct to the line. On the left side of each coil, numbered 1 and 2, three Wurts arresters, each containing seven nonarcing cylinders, with about one-twentieth inch gap, are tapped off in series, there being thus two series of three arresters each, for the first two coils. The free ends of the two series of arresters from coils numbered 1 and 2 are closed together, the connection thus formed being termed "point a." Similarly the two series of arresters from coils numbered 3 and 4 are connected at point b, as are also the two series of arresters of coils 5 and 6 at point c. From points a and b are then carried a single series of five arresters, the ends of these series being joined at the point d, while from point c is run a single series of eight arresters which are connected to (at point e) the terminal of a single series of three arresters between d and e. Eleven choke coils therefore, intervene between point e and either of the six choke coils referred to, while from point e is continued a single series of fourteen arresters running to ground. About twenty-five arresters intervene between any choke coil and ground while a minimum of six arresters are across a coil.

Two further features of interest, also shown in the engraving last referred to, are found in

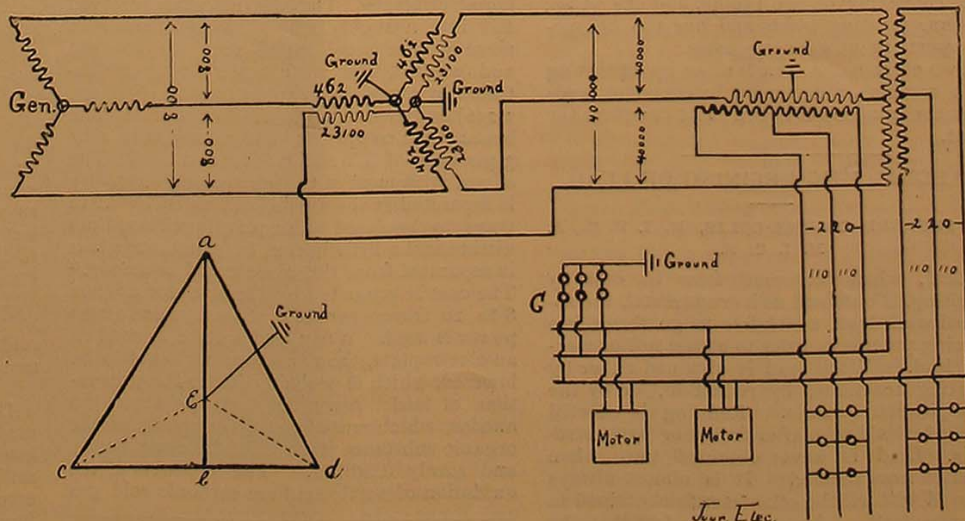
the fuses inserted in the high tension wires, and in the high tension switches used. Each of these three fuses consists of a single number 30 B. & S. bare copper wire, thirty-six inches in length, over which an asbestos tube is drawn. The fact that three such thread-like wires will carry a load of over seven hundred horse power, is as incredible to the layman as it is evident to the electrical engineer, who fully realizes the significance of transmission at a potential of 40,000 volts.

The high tension switches, illustrated on page 10, are inserted on each of the three line wires. They are rigidly connected together, so as to be operated by a common switch bar as shown, and each give to a six-foot break, the separation between the switches being five feet.

The substation now in operation is installed in the Golden Gate mill, at Mercur, which is believed to be one of the largest, if not the largest, cyanide mill in the world. Its electrical equipment, aside from the induction motors used for mining and milling purposes, and as about to be described, consists of three, 300-kw. lowering transformers, by means of which the 40,000 volt three phase line current is reduced to 220-volt, two phase current, used for lighting and for operating Westinghouse two phase type "C" induction motors. The plan of connections for the step-down transformers is shown in the sketch "outline circuits," which is a comprehensive outline drawing of the electrical connections of the entire equipment from the generator to the ultimate motors and incandescent lights operated by the system.

These lowering transformers are the same in general design as the raising transformers in the power house at Provo Canyon, and differ therefrom only in capacity and voltage. It will be noticed, too, that, as in the case in the generating station, an extra transformer is installed for emergency use, and its connections are so arranged that it can be substituted for either of the other lowering transformers with celerity.

The transforming of three phase current to two phase current, and vice versa, by two transformers, is generally understood, and will therefore not be taken up. As previously stated, the neutral point of the three phase system in both the generator and the high tension side of the raising transformers are grounded, and the practice of grounding is carried out even in the low tension distribution circuits in the manner to be shown.



OUTLINE CIRCUITS OF PROVO-MERCUR TRANSMISSION.

The neutral point of a three-phase circuit, in a three-phase two phase transformer, may be determined graphically by erecting the perpendicular ba from the center of the side cd of the equilateral triangle shown in the corner of the plan herewith of circuit connections, and upon this perpendicular, ba , locate the center of the triangle, as shown at the point e . Let the line ab represent the 100 per cent side of a three-phase two-phase transformer, when the line ec will represent the 86 per cent transformers, and the point e will be one-third of the length of the line ba measured from b . It is at this point that the tap for the ground is brought out, and it is located in the three-phase two-phase transformers at one-third of the turns of the 86 per cent transformer, from the side connected to the center of the 100 per cent transformer.

The 220 volt secondary is also grounded through incandescent lamps, as shown at C , where two 110-volt lamps are connected in series between either of the three wires of the two-phase distribution, and the ground. Moreover, a tap is brought out from the center of each of the three single phases comprising the two-phase system, and this tap constitutes the neutral wire of the Edison three wire system, which is used at Mercur for incandescent distribution service. Lighting service is taken from both transformers, great care being exercised to keep the entire system balanced, not only as an Edison three wire system, but also to keep each of the two phases balanced with the other. The thoroughness with which the various portions of the high tension three phase system is grounded, as well as the effectual grounding of the 220-volt system, leads to the belief that no danger from shock is presented.

A further feature that will excite surprise is the fact that current is carried from the lowering transformers to the center of distribution in the Golden Gate mill and hoist house by a three-conductor concentric cable, each of the three conductors having a sectional area of 1,000,000 circular mils. The length of this cable leading into the mill is 220 feet, and from its terminal is tapped off leads for six induction motors, consisting of one 150 hp. operating rolls, etc.; one 50 hp. motor operating the roasters; one 30 hp. motor operating pumps; two 15 hp. motors operating blowers, and one 10 hp. motor in the machine shop. The length of cable leading into the hoist house is about 60 feet, and from its terminal is tapped off leads for three motors, consisting of one 150 hp. and one 75 hp. motors operating hoists and one 100 hp. motor operating an air compressor.

Two other motors, each of 50 hp. operating rock crushers, are run on independent leads from the transformers, and these complete the plant.

ELECTROLYTIC REFINING OF LEAD.

BY SHERARD COWPER-COLES, M. I. E. E., A. M. I. C. E.

Lead, when recovered from its ores by smelting, is obtained as a crude metal, the so-called work lead, which has to go through a refining process in order to obtain soft or market lead. Work lead is obtained either by roasting reactions, by reduction, or by the precipitation process. Refining is effected either by oxidation after fusion or by electrolysis. Lead is never obtained pure when smelted from the ore. It is almost always alloyed with all the other metals contained in the ore itself. Apart from the fact that the useful properties of the metal are affected by

these other metals, it is, of course, advisable for economical reasons to recover the precious metals present, such as silver.

One of the first processes worked on a commercial scale for the electrolytic refining of lead by electrolysis was that of Keith. In this process the crude or work lead is melted at the lowest possible temperature in iron kettles from which it is tapped into molds. The anodes thus produced are fastened to metal rods by suitable clamps, and enclosed in close-fitting bags of coarse muslin. The electrolyzing cells are made of wood or iron; the cathodes are thin metal plates attached to rods in a similar manner to the cathodes. The electrolyte is composed of lead sulphate dissolved in an aqueous solution of acetate of sodium; it is made by electrolyzing with lead anodes a mixture of $1\frac{1}{2}$ lbs. of acetate of sodium, $2\frac{3}{4}$ ounces of sulphuric acid and 1 gallon of water, and is heated to 38°C . The sulphuric acid attacks and the acetate dissolves the lead, zinc and iron of the anodes. The zinc and iron, being electro-positive to lead in the liquid, are less easily reduced to metal and accumulate in the solution, and when dissolved in considerable quantity are, to some extent, deposited as oxide on the cathode, the current density employed being about 1.86 amperes per square foot. The lead which is deposited on the cathode is crystalline in form and separates continually from the plates, a space being left in the cells for its accumulation. When the anodes have been dissolved, the bags suspended from their supporting rods are carried to a reservoir and the residual solid matter from the plates is washed and returned to the melting kettles. The slimes suspended from the wash water are allowed to settle, the water is drained off, and the residue filtered. The slimes usually contain antimony, arsenic, silver, copper, gold and iron. A process that has been recently tried on a commercial scale is that of Tommasi. In this case, the electrolyte is the double acetate of lead and potassium (or sodium), the anodes are crude argentiferous lead, and two of these are opposed to a copper or aluminum alloy cathode, which is in the form of a disk rotating at the rate of from one to two revolutions per minute.

These disks are about 10 feet in diameter and three-quarters of an inch thick and are half immersed in the liquid. At the upper part are scrapers which serve to detach the small spongy crystals of lead which form during electrolysis. The crystals when removed fall into channels which convey them to a sieve of wire gauze where they are drained and washed, the wash water being concentrated by evaporation to 20 Baume (sp. gr. 1.256) and used again in the electrolyte. The lead is then compressed and mixed with 2 or 3 per cent. of charcoal powder and fused. The silver, with most of the arsenic and antimony is separated at the anode, and is collected in trays to be fused subsequently with sodium nitrate and a little borax, by which the silver is separated from the arsenic and antimony.* The cost is estimated by the inventor at from 8 to 10 francs per ton of lead when steam power is used. When lead acetate is used as an electrolyte, the resistance is found to be lowered, which is probably due to the prevention of lead peroxide deposits upon the anodes, which must be at the expense of the organic substance itself which becomes slowly and surely oxidized. The products of the oxidation of acetic acid are carbonic acid gas

and water, which are of no intrinsic value. This being the case, the acetic acid becomes an expensive electrolyte as it has to be constantly renewed. The lead peroxide formed at the anode is reduced by a portion of the organic acid to oxide, which then dissolves in the acid and becomes finally reduced to metallic lead at the cathode. The impurities present in the crude metal and the oxides on the face of the anodes are usually bad conductors of electricity, and, if they do not become detached from the anodes, they form an insulating coat over a large portion of the anode surface. The natural consequence of this is that the current passes mainly through those parts of the plate that remain freely exposed, and so the current density becomes greatly increased at these portions with the result that the anode is rapidly riddled with holes. The addition of fluid carbonic acid when mixed gradually with sulphuric acid, and digested for some time at a temperature of from 50 to 100°C . easily converts it into cresol sulphuric acid, which is soluble in water, and is capable of forming soluble salts with lead. These salts have been successfully used for the deposition of lead.

Maxwell Lyte has suggested converting the lead into chloride and electrolyzing it in the molten condition. Crude lead is fused and oxidized by a blast of air in a converter, the oxide is then stirred with hydrochloric acid in earthenware vessels until it is converted into chloride. Any silver compound associated with the lead, salt or oxide treated, is chloridized and is extracted from the mass by the application of strong hydrochloric acid or brine.

Concerning Chlorination.

VANCOUVER, BRITISH COLUMBIA, July 13, 1898.
TO THE EDITOR
MINING & METALLURGICAL JOURNAL,
Srimson Block, Los Angeles, California.

SIR:—When pointing out the error in the description of the Chlorination Process, I omitted to give the equation showing the reaction which takes place when the lime chloride (not lime, as inadvertently stated by me) is acted upon by hydrochloric (muriatic) acid as follows: $\text{CaOCl}_2 + 2\text{HCl} = \text{CaCl}_2 + \text{H}_2\text{O} + \text{Cl}_2$.

Yours faithfully,
(Signed) J. O'SULLIVAN,
Chief Assayer and Chemist, The British Columbia Agency Ltd.

While hydrochloric acid and chloride of lime are used in chlorination processes, the combination is not received with as much favor as the combination of sulphuric acid and chloride of lime, $\text{CaOCl}_2 + \text{H}_2\text{SO}_4 = \text{CaSO}_4 + \text{H}^2\text{O} + \text{Cl}_2$, for the reason that the difference in price of sulphuric acid and hydrochloric acid which is as about 10 to 19 in favor of sulphuric acid, or nearly one half less. Of course, we have to take into consideration that it requires more sulphuric acid than it does hydrochloric acid to do a stipulated amount of work, about as 73 to 98; in other words, 73 parts of hydrochloric acid will do as much work as 98 parts of sulphuric acid, but it can be readily understood that the difference in price more than balances the difference in quantity.

The fact of the matter is hydrochloric acid is principally used in laboratory work, and seldom on a commercial scale for the treatment of ores.

Due principally to the fact of concessions made by the smelters and railroads, and the leasing system now in vogue, also to the new mills and concentrators that are being erected, many of the mines which could not have been operated after the panic are now in a position to make a profit.

*The arsenic and antimony are oxidized to the maximum and unite with the soda to form scoria.

THE ELECTRO-CHEMICAL INDUSTRIES OF ENGLAND.*

JOHN B. C. KERSHAW, F. I. C.

Twenty years ago the industrial applications of electricity in Europe in the domain of chemistry and metallurgy were limited to two manufactures—that of electroplate, a business in the hands chiefly of the famous Birmingham firm of Elington Bros., and that of refined copper. The latter industry was carried on upon a very small scale of operations, and the combined output of the Pembrey and Hamburg refineries—the two largest at this date—did not much exceed 1,000 tons per annum, while the total number of refineries in Europe was only six or seven.

Ten years later, electro-plating and copper refining were still the only two electro-chemical industries. But the latter industry has steadily increased in Europe under the stimulus of the demand created by electrical engineering for the purest form of copper, and the electrolytic method of copper refining had been introduced into the United States by the Balbach Company of Newark and by the Baltimore Smelting and Refining Co. At this date there were four electrolytic copper refineries in operation in England, with from eight to twelve scattered over the Continent of Europe.

The progress that has been made since 1885 has however been remarkably rapid, and while ten years ago there were many who believed electricity would have but a very minor role to play in the chemical and metallurgical industries, the enormous expansion of the electrolytic copper refining industry, and the marked success which has attended the use of electrolytic methods in the manufacture of aluminum and chlorate of potash, have now reduced the number who hold this belief to a very small minority of the community. This change in the views of practical men with regard to the possibilities of electricity as an agent for promoting chemical reactions upon a manufacturing scale, is due to the rapid growth of the past ten years.

There are now no fewer than eighteen distinct electro-chemical or electro-metallurgical manufactures carried on in different parts of Europe and America in over 150 manufacto-

*Electricity.

ries, while the production of one article—electrolytic copper—has increased from between ten to twenty thousand tons in 1887 to over 150,000 tons in 1897—that is, to an amount nearly equal to one-half the total copper production of the globe.

This progress would have been impossible except for the cheapened sources of electricity that are now available when current is required in large quantities.

The experience gained in the period 1880-1890, when electric lighting was absorbing all the attention of electrical engineers, has led to valuable improvements in the efficiency of both engines and dynamos, and the more recent development of large water powers for manufacturing purposes has still further tended to reduce the cost of electrical energy. This is today being produced for manufacturing operations at a cost which twenty years ago would have been considered below the limits of possibility.

Great as the electric lighting industry has become in both Europe and America, there are only a few lighting installations in either continent with a dynamo capacity equal to that of some of the larger and more important industrial undertakings of the character now under consideration.

In these electro-chemical industries, single power plants of between 2,000 and 4,000 H.P. are common; and the greater portion of the power to be developed from the numerous water-falls of both the New World and the Old will undoubtedly find utilization in these comparatively new industries.

In England, owing to the lack of large natural water-powers suitable for industrial development, the electro-chemical developments that have occurred have with two exceptions had to depend upon coal for their supply of the electric current; and two of these undertakings possess steam plants of the most modern de-

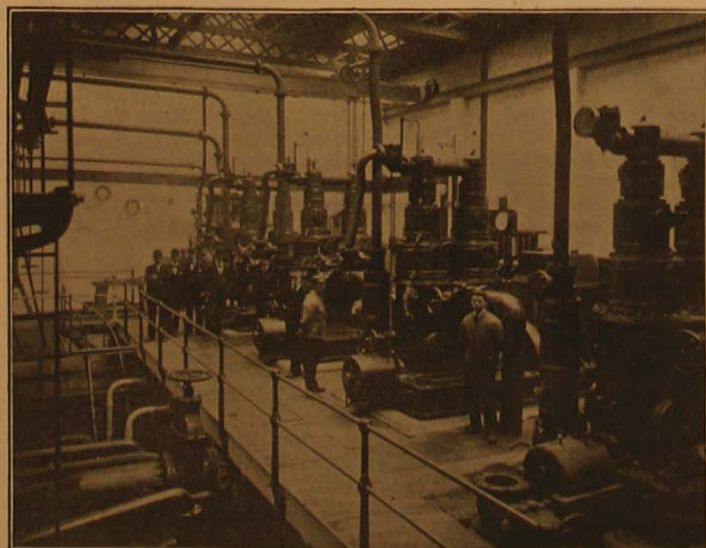


CELL ROOM IN THE CASTNER-KELLNER ALKALI WORKS, WESTON POINT, ENGLAND. CAPACITY 1,000 H. P.

scription for generation of their electrical energy.

The Castner-Kellner Alkali Co.—Two views are given of the works of this company at Weston Point, Lancashire. The company was formed in 1896 with a capital of \$1,440,000 and the manufacture of caustic soda and bleach by the first 1,000 H.P. installment of plant was commenced early in 1897. The results of the working of this plant have been satisfactory, and the extension of the works to the originally designed capacity of 4,000 H.P. is now proceeding. The shares of this company were quoted at a premium at the commencement of the present year, a fact that speaks well for the confidence of the investing public in the future of the undertaking. The process depends upon the decomposition of a solution of common salt by means of the electric current, mercury being used as cathode material and carbon for anodes. By a mechanical device the cells are subjected to a periodical tilting movement which brings the sodium amalgam formed at the cathode into contact with water, and, whilst regenerating the mercury for use in the cathode compartment of the cell again, produces a solution of sodium hydrate practically quite free from sodium chloride. The chlorine liberated at the carbon anodes is conducted away, and is used in the ordinary manner for the manufacture of bleaching powder.* The English Castner Kellner Company has made a deal with the "Deutsche Solvay Werke Aktien Gesellschaft" whereby the latter company has undertaken to accept delivery of the whole of the bleaching powder product at Weston Point during three years at a fixed price. This arrangement of course gives stability to the position of the Castner-Kellner Company and ensures a market for its products. Owing to the output of bleaching powder by this company and by the other electrolytic alkali company at St. Helens, the market price of 35 per cent. bleaching powder has already dropped about \$5 per ton, and a further fall may occur during the present year. Some difficulty has arisen, it is believed in the conduct of the electrolytic process, due to the impurities of the brine pumped from the Cheshire salt mines and the second 1,000 H.P.

For further details of this process, see *Electricity*, September 8th and 15th, 1897.



ENGINE AND DYNAMO ROOM OF THE CASTNER-KELLNER ALKALI WORKS, WESTON POINT, ENGLAND.

installment of plant is to be used for the production of caustic potash from Stassfurt potassium chloride. It may interest some of our readers to know that this process is now at work at Niagra in the factory of the Mathieson Alkali Company, and 1,500 HP. is now utilized at this spot in the production of caustic alkalis and chlorine products. A minimum royalty charge of \$19,200 per annum is to be paid by the Mathieson Company to the Aluminum Company of Oldbury, England, who at the date of this agreement were the owners of the American rights of the Castner-Kellner process.

CORRESPONDENCE

WISCONSIN.

WEST SUPERIOR, WIS., July 21, 1898.

EDITOR JOURNAL:—The North Wisconsin copper mine, of Douglas Range, 15 miles south of Superior, has arranged to continue the development work begun last fall. The 16-foot amygdaloidal vein carries 1 to 2 per cent native copper. The company has sunk 64 feet on the vein, and has drawn a shaft of drift 26 feet along the vein. Several other pits have been sunk on the property. Considerable interest is shown locally on the formation, and much prospecting has been done the whole length of the range, which discloses at many places promising outcroppings of cupriferous rock; the formation extends in an east and west direction across Douglas County, Wisconsin, and is exposed again southward from the Michigan line to Minnesota.

KIRBY THOMAS.

Miscellaneous Mining News.

ALASKA.

In a letter to a Southern California mining man an assayer writes: "Sunrise City is at the head of Cook's Inlet, and there are a lot of people here but few miners, and the majority are waiting to get back to the States. They can't find gold on the bushes and have to pack everything on their backs in going about, and this makes calamity howlers out of most of them pretty quick. The company I am with has bought two claims for \$3,000. They are considered among the best here. I have been prospecting them for the past ten days and they prospect pretty well all over. I can make \$5 per day and not reach bedrock. Bed-rock is about 17 feet from the surface and both claims can be worked without hindrance from water."

ARIZONA.

From Big Bug.

The Little Annie has stopped most of her work until an air compressor and Burleigh drill can be obtained. Then the Providence Mining Co. will prospect the entire Annie mountain. This company is thinking of placing a smelter about a mile down Big Bug from their mine.

Mr. Kent and son, owners of the Lottie and Postmaster mines, are expected from the east in a few days. Mr. Kent is now having a tunnel run 600 feet through the mountain in order that the Lottie mine may be drained of its water. This tunnel is now about 400 feet long and six men are constantly at work on the east end of it.

The Henrietta mine has been taken in charge by Mr. Henry, who will pay the indebtedness on this mine and again resume work.

The Swindler mine, owned by Mr. Brindley, was bonded to Mr. Shirley July 15 for an unknown amount, but it is to be paid at the end of six months.—*Arizona Republican.*

CALIFORNIA.

KERN COUNTY.

The famous Long Tom property, near Bakersfield in Kern county, was recently sold to a Pittsburg syndicate for \$160,000.

J. W. Waltham has taken a bond on the Golden Bar mine, and has already installed a gasoline hoist and very systematic prospecting work will be done. A new innovation in the methods of mining in this camp will be introduced in the shape of a female engineer. Mrs. Waltham will have charge of the hoist and a general superintendence of the mine. As she adopts while on duty the regulation overalls of our profession, us "Hardrockers" extend to her the glad hand and wish her luck.

The most important find in the camp so far has been the new strike of sulphuretted ore in the Little Butte, at a depth of 500 feet. The ore body shows a five foot vein of dark, close-grained, bluish-looking quartz and mills about \$15 free gold with the sulphurets worth about \$88 per ton. More than anything else it shows the permanency of the ledges as for the pitch of the ore chute the same vein passes under the Kinyon and Wedge only at a greater depth. The Little Butte people are feeling mighty good over their prospects and employees take renewed courage.—*Miner.*

LOS ANGELES COUNTY.

The reorganization of the Red Rover Mining and Milling Company has taken place, and preparations for the commencement of active operations on the Red Rover mine at Acton have been made. The former superintendent, Mr. Gilbert, said there was a considerable quantity of ore in the bottom of the sixth level that would mill between \$5,000 and \$6,000 per ton. The mine is well developed and has a fine plant of milling machinery, besides an extensive water works plant, all of which has been paid for from wealth taken from the mine. The company is about to put in a still larger water works on Gleeson Mountain, and expect to supply the town of Acton with water.

Frank McCann and others are about to erect a cyanide plant on Gleeson Mountain, to do custom work. The whole of the Cedar Mining District is known to abound in cyaniding ores, which, with a plant to work them, will bring that section prominently to the front.

RIVERSIDE COUNTY.

The stamp mill at Dale City, belonging to Ingersol, Esler & Reitz, is now erected and began to stamp ores this week.

H. C. Steele of the Desert Queen mine has returned to the city on account of illness. The work on the mine still continues.

The tailings of the Desert Queen mine will be cyanided in the tanks of the Old Virginia mine by Jackson Steele, who has purchased them.

SAN BERNARDINO COUNTY.

J. C. Littlepage and William Van Slack have returned to San Bernardino from their

mine in Morengo district, where they have been doing some work. They intend to put in a five stamp mill in September.

A number of miners came down to San Bernardino from the Rose mine last week. They report great activity around the mines, and the discovery of a good body of ore at the seventh level, which averages \$30. The mill is not running on account of the scarcity of water, but workmen are now engaged in boring a 200 foot well in search of a good supply.

TUOLUMNE COUNTY.

The Brewer & Adams.

One of the greatest strikes the county has seen in a long time was made the first of the week in this mine, some of the ore extracted showing a value of \$15,000 per ton. The property is situated on the west side of Turnback Creek, and is an extension of the Pine-nut.

COLORADO.

Idaho Springs.

The Gold Medal mine, on the east of Seaton mountain, is running a cross-cut tunnel from the gulch some 600 feet below the main shaft. This tunnel is now in ten feet, and will be driven continuously for the eighty feet which are between the breast and the Gold Medal vein. As soon as the vein is reached it will be drifted on for 1,800 feet until a connection is made with the shaft. This property has produced some remarkably high-grade gold ore and can be relied on to live up to its reputation in the future. Mr. Emigh is the superintendent.

E. P. Blaisdell and Charley Corkett are sinking surface shaft on the Pride of Cascade lode, Ute creek, and are obtaining at grass roots quartz liberally sprinkled with chlorides, carbonates, sulphurets and some live mineral. The indications are flattering for an old-time Ute creek surface pocket and Blaisdell feels quite elated.

Crystal Items.

Seven men are at work at the Burke on Mineral Point, Gunnison county, getting the new tunnel under way in good shape. Work will be carried forward vigorously, and probably a contract will be let on the tunnel to drive it to cut the ore.

Two men have been added to the Inez force and we trust it will only be a few days until the force in this property is doubled. The present showing in the Inez is such as to lead one to expect good things to result from a comparatively small amount of development work.

Leadville Notes.

The Preston Mining and Milling Company, operating a large territory on Long and Derry hills, are about to push operations with three shafts. Ore has already been opened up which samples thirty ounces silver, 15 per cent lead and moderate values in gold. Mr. Darlington, of Kansas City, a heavy owner in the enterprise, visited the mine recently and seemed to be well pleased with the outlook.

The present lessees of the Nisi Prius Consolidated Mining Company's mines, in addition to the extensive work being done on the Hall shaft, are preparing to take the water out of the Crown Point shaft so as to get at sev-

eral small streaks of very high grade ore left when their property was formerly worked. The profits from the Carbonate workings will enable the operators to unwater the Crown Point shaft.

IDAHO.

The rolls for the Black Cloud concentrator, near Wallace, Idaho, arrived last week, and were at once taken up to the mill and placed in position. This places the mill in order for active operation and work was started on August 1st.

W. C. Squires, Talcott and E. D. Squires are the discoverers of a very promising mining claim in Lawyers' canyon, in the deep gorge about five miles from Nez. Pierce City. The ore assays 83 ounces silver and 11.10 in gold. Total, \$227.60.

W. R. Mix and John P. Mix, of Moscow, will leave for Florence to continue development work on the Red Bird and Double Standard mines in that camp. W. R. Mix, who is superintendent of the company now developing the Red Bird under bond, spent the past winter sinking a shaft on the property. He also crosscut 100 feet on the ledge which at a depth of 130 feet is two and one-half feet wide. During the present summer several hundred tons of ore from this shaft will be milled.

MICHIGAN.

The Quincy Mining Co. has declared a dividend of \$3.50 per share, payable August 10, to stockholders of record on July 22. The last dividend paid was \$3 per share, in February, 1898. The amount of the present dividend is \$350,000, and it will bring the total amount paid in dividends by the company up to \$10,120,000.

The Wolverine company last week bought eighty acres of land directly west of the mine owned jointly by the Shelden, Douglas and Wolverine companies. The Kearsarge lode dips into the land and its possession will enable the Wolverine to mine to a depth of 5,000 feet. The price paid was \$130,000.

MINNESOTA.

The hearing over the reduction of iron ore freights from the Minnesota ranges to the lake ports has been in progress for a week, and so far the railroads have been ahead, except that the complainants have been able to show that the companies are making a great profit on the present rates. The hearing will continue two weeks longer.—*Engineering and Mining Journal.*

Wright-Davis Mining Company.

This company, with general offices at Saginaw, Michigan, and operations in Minnesota, filed articles of association in Saginaw recently. The capital stock of \$750,000 is held by the following people: A. W. Wright, C. H. Davis, W. T. Knowlton, G. M. Stark, E. P. Stone and A. Boutelle, all of Saginaw; J. F. Killorin, Duluth; Russell & Vincent, Minneapolis, and George F. Reynolds, Cheboygan, Mich.

MISSOURI.

Thos. Conner, John F. Wise and Joe Aldrich have purchased 40 acres of land near

Central City of Mrs. Barnes, for \$4,000. The tract adjoins the Missouri Central company's lease on the northwest. The land was purchased for its mineral value.

Bonshe & Company have leased the old Hickox farm south of Shoal creek and east of Redding's flour mill, and are taking out big chunks of lead ore from a drift six feet from the surface. Two men working two days took out 5,000 lbs. of lead ore.

On the Crown Point lease the Little Joe mine at Duenweg, is producing 20,000 lbs. of lead weekly with two men in the ground.

MONTANA.

The Old Glory mine, now in operation on a lease by J. Benton Leggat, is again on the list of producers. Mr. Leggat has made one of a series of shipments of ore to the Colorado smelter. Ore is being taken from a good-sized shoot at the 700 foot level and the returns show about 10 per cent. copper, 25 ounces in silver and some gold.

The southern portion of the mill at the Granite Bimetallic Consolidated Company's works, consisting of fifty stamps, has been started and is now running satisfactorily. The northern part of the mill has been shut down and is receiving a thorough overhauling. During the long shut-down the timbers and bolts have become loosened and it was necessary to replace a good many by new material, put in new foundations for the mortars in several places and make other repairs before it will be in first class running order.

The Blacktail district is 30 miles south of Libby creek. The ore is free milling. The formation is slate with occasional porphyry. Anaconda men own the Bell group, upon which the principal development consists of a main tunnel 100 feet, two tunnels 50 feet each and four shorter ones. These show the lead from six inches to six feet wide. It will probably average two feet. The Lucky Boy lies across the apex of the ridge and on Bramlet Creek slope and adjoining is the Lake claim, lying across the head of the creek. The former has a 50-foot tunnel. The Lake has one tunnel 25 feet, one 30 feet and a shaft 25 feet with a drift 25 feet long from the bottom.—*Helena Independent.*

NEVADA.

Nevada Mine Sale Suit.

Suit has been brought in the Utah United States court against Philo T. Farnsworth of Salt Lake City for the recovery of \$110,751 alleged to have been withheld through fraudulent misrepresentations as the price paid for mining and other property in Ione, Nye county, purchased for a Nevada company.

There were two transactions alleged as fraudulent in the complaint. The first alleges that the company furnished Farnsworth \$60,000 to purchase a stock of merchandise and other property at Ione for which he paid less than \$20,000. The second charge is that defendant was intrusted with \$130,000 to purchase the Ione Gold Mining Company's property for which he paid only \$80,000, withholding the balance of the money advanced in both transactions.

The Nevada company, or rather its board of directors, also operate the Nevada Central railway, which runs from Battle Mountain to Austin. The company's mining property is principally situated in the Austin mining district in Lander county.

NEW MEXICO.

The *Herald* of Bland, New Mexico, published the following description of the Cochiti cyanide plant:

The application of the cyanide process to the various ores found in the Cochiti district has been a difficult problem to solve, and the development of a suitable process is all that is required to make this one of the most important gold camps in the country because the immensity of the ore bodies has already been demonstrated. This the Cochiti Gold Mining Co.'s plant will unquestionably do. It is one of the most complete reduction works in America, and in the west is only equalled in completeness by the Golden Gate cyanide plant at Mercur, Utah.

Part of the mill has already begun operations and by the 10th of August the big plant will be running full blast.

The mill consists of steel frame and steel sheeted structures of a combined size of 350 x 75 feet; a hoist house and gallows frame; a leaching house 180x75 feet, containing five steel solution tanks 12x8 feet, 12 steel leaching tanks, 26x8 feet, eight precipitating tanks 15x8 feet, troughs and pumps for returning the cyanide solution to the tanks above; two additional rooms, consisting of an assaying room 30x25 feet and a department 90x30 feet to contain launders and batteries; a furnace and boiler room 40x25 feet, containing two furnaces and boilers of a capacity of 100 horse power each; and engine room, 40x50 feet, containing machine shop, Ingersoll-Sargeant air compressor engine for operating drills in the mine, General Electric Co.'s dynamo with a capacity of 15, and a magnificent Corless engine made by the Edwd. P. Allis Co., with a horsepower of 160; a crusher and dryer house, 100x75 feet, containing two large ore bins of a capacity of 100 tons each, two crushers, eight roll feeders, two large furnace and rotary dryers, elevators, eight pulp rolls operating over two steel pulp bins of a capacity of 100 tons each. The two mill buildings, partly divided, are monstrous structures of steel with large girders and roof trusses gracefully light but strong. The mill is admirable adapted for the purpose, being most conveniently arranged, well lighted and ventilated, and is an excellent example of the great superiority of steel over wood for plants of this character. It is as near fire-proof as it is possible to build any structure. Besides being entirely of steel and masonry, it is lined throughout with asbestos sheeting. It sets in a cut out of solid rock, towering above the rear side, a face of rock some 40 feet high.

OREGON.

Mines of Cracker Creek.

It is stated that of the many prominent mining districts of Eastern Oregon, Cracker creek may be classed among the first. The North Pole, Columbia and E. & E. have given Cracker Creek wide fame, and now comes the Golconda, which promises even better than the older mines. The Golconda is off the market, and is in the hands of people who have money to develop it without taking out a pound of ore. Enough is known to safely assert that an ore body of unusual richness and extent has been opened up and that rush orders have been given, and men put to work to further develop the property and to put in a big mill, which it is asserted can be kept busy for an indefinite time on ore already uncovered.

The E. & E. is working about sixty men

in the mine, and one-third of that number in their 20-stamp mill. The mill is handling 80 tons of ore daily, reducing to concentrates at a ratio of 25 to 1.—*Oregon Mining Journal*.

SOUTH DAKOTA.

D. C. Boley has let a contract to run a 50-foot tunnel about 25 yards from the shaft in Blacktail gulch, to D. H. McDonald and N. S. Peck.

The Keystone mill is being enlarged at present by the addition of 20 more stamps. Ed. Major, who built the Kildonan, and the St. Elmo, is superintending the work.

Chas. H. Lockie and Chas. Graham have purchased the lease formerly held by Thomas Adams on part of the Dakota Maid. The new owners intend to put a force of men at work sinking on both shafts.

Work is progressing as rapidly as possible on the chlorination works at Rapid City. The boilers were tested last week and the familiar sound of the old steam whistle brought a hearty cheer from the citizens of Rapid. Col. Day thinks everything will be in readiness for the reception of ore in three or four weeks.—*Black Hills Mining Review*.

UTAH.

The *Mining Reporter*, of Denver, has a very interesting article from one of its correspondents, in the La Sal mountains of Utah, from which we take the following extracts:—

"There is probably no new mining section in the western country of which there is so little known as the La Sal district, bordering on the western part of Colorado. Many contend that this promising section of country belongs in a greater part to Utah, but as yet no Utah men have shown a disposition to develop its various resources. In fact, there are no class of miners and prospectors developing and exploring this section but Colorado men.

The La Sal range proper is divided into what is known as the north and south divisions, separated by a low pass called Geyser pass.

Very little prospecting has been done in the south division, yet one of the biggest copper mines of the country is being developed there, the Big Indian property, recently purchased by Ed. Loose and others, of Provo and Salt Lake, from Capt. May and S. N. King, two well known San Juan, Colorado, mining men. There is a big country between Geyser Pass and the south end of the mountain, and from reports, some rich gold and copper veins are being discovered."

WASHINGTON.

Colville Reservation.

Some good reports continue to come in from Sheridan Camp, although not much development work is going on at present. Snyder & Carter's claims show up well, as do several others along the main ledge. The high assays come from narrow seams in the ledge matter, but it is believed that these rather meagre veins will widen as depth is reached. All those having prospects at Sheridan are confident of finding rich and large deposits at lower depths. The latest assay from there shows \$65 in gold and 920 ounces in silver.—*Miner and Electrician*.

FOREIGN MINING NEWS

BRITISH COLUMBIA.

"Since the Canadian Pacific bought the Trail smelter, it has been overhauling and enlarging it. It is being changed from a two to a five-furnace plant, so that it will handle from 750 to 1,000 tons every twenty-four hours, and will treat not only sulphide but silver-lead ores from the Slocan. The entire plant will be run by electricity, for they are now equipping it with motors. They have a plant of 400-horse power in the town, and are bringing in wires from the Kootenay Power Company's plant at Bonnington Falls on the Kootenay River, which will develop 10,000 horse power, and will supply the whole district. The company has reduced the cost of freight from Rossland to Trail, and of treatment at the smelter from \$11 to \$7.50 a ton, and will make lots of mines pay which would not pay at the old rates. Some of these have begun development, and will eventually ship ore. The War Eagle is putting in an electric plant and will be the first to use that power.

A Good Showing.

The mines in Rossland are turning out ore in a manner which promises to fulfill even the most sanguine prediction as to the future of the great camp. The War Eagle is now sending out about 1200 tons per week, and when machinery, now in process of installation, is in working order, the output will be materially increased. The Center Star will join the ranks of the steady shippers as soon as the new electrical hoist is in place. The Iron Mask is shipping regularly as is the Monto Christo. The Le Roi is about to increase from 200 tons per day, and it is stated that the Columbia-Kootenay will soon join in increasing the already great stream of ore constantly flowing from this camp. All together this is a showing of which Rossland may well feel proud.—*B. C. Mining Critic*.

LOWER CALIFORNIA.

The Trinidad Mining Company, owning the Trinidad group in the Jacalitos district, which includes the Piedad mine, contemplates the extensive development of its property and will probably commence work within a fortnight. All these evidences of renewed activity, taken in connection with the two new prospecting mills for the Socorro district to the south, and a marked revival of the industry at Calmali, give Peninsula mining a more promising outlook than it has enjoyed for a couple of years past.

MEXICO.

Zacatecas.

The San Cristobal Gold Mining Company, a New York concern, has recently put in a large thirty-stamp mill, and it is reported that the Richmond and Zacatecas Gold Mining Company will soon put in at their Australia mine and Anexas a large and modern milling plant. The mine is situated within 2,000 yards of the town of Zacatecas, and it has a large and well-defined vein of fairly good ore. Owing to one cause or another, however, the mine has never been handled to advantage, but the shareholders are now beginning to hope for better things.

Chihuahua.

The Reina mine near Cusiuhirahic, is producing a large amount of rich ore. It has 4000 miners at work. In the last year it has produced \$500,000 silver, has also an equal amount in ore on the dump and over a million more in sight. The Santa Elena, in the same district, ships from 40 to 75 cars of ore daily to the Aguascalientes smelters. Many new mines are being denounced in that part of the state and some of them promise to be very rich.—*Chihuahua Enterprise*.

PERSONAL NEWS ITEMS

P. LAWRENCE of Butte, Montana, is in Los Angeles for his health, having recovered from the third attack of pneumonia.

JOHN BECK of the Bullion-Beck, devoted several days to a visit in Colorado last week.

R. S. SPENCE, chief owner of Humming Bird, Paris, Idaho, is in Salt Lake City, Utah.

A. C. LIPPENCOTT, of Boise, Idaho, was in Salt Lake City last week for several days.

M. W. GIBBONS, of the Kasser G. M. Co., has returned to Globe, Arizona, from California.

T. R. JONES has returned to Utah from a visit among the smelter men of the east.

CHAS. H. KARLSRUH, president, and A. Vos, secretary-treasurer Phoenix G. M. Co., Nevada City, California, have returned to their homes in the east.

W. H. ALLBRIGHT of Boston, has been visiting Utah, where he has several mining interests.

P. KERWIN of the Comstock at Virginia, Nevada, is at Grass Valley, Cal., examining the Allison Ranch mine.

S. B. MILNER has been elected manager of the Dexter Mining Co., at Tuscarora, Nevada.

GEO. CROCKER, of the Southern Pacific Co., is putting \$100,000 into the development of the Alicemine Idaho Springs, Colo.

A. THIES of the Haile Mine in South Carolina, visited New York last week on his way home from a short vacation trip.

R. NICHOLS, formerly superintendent of the Sutro tunnel and now a mine manager at Coolgarde, West-Australia, is in Virginia City, Nev.

MESSRS. B. H. PAYNE, C. C. MCCARTHY, WILLIAM BRILL, F. A. DAGGE and COL. CHAS. E. WARE recently inspected some mineral land near Joplin, Mo., which they propose to develop.

O. S. BUCKBEE, who went to Fort Mohave, Ariz., a few weeks ago to become superintendent of Sheep Trail mine, is at home in San Francisco, Cal., in ill health.

W. E. RICHARDSON, mining engineer, with La Dura Mining & Milling Co., is in San Francisco, Cal. The company's mines are in Sonora, Mexico, about 100 miles from Ortiz, on the Sonora railroad.

J. C. BOYD of the Guston M. Co., at Guston, Col., is on his way to Tasmania via San Francisco, whither he goes on mining business for his company.

CHAS. H. MERRILL, who has been engaged for two years past in mining explorations in Michoacan, Mexico, was in New York last week. He purposes spending a month in the east, after which he will go to South America on professional business.

W. H. HARDINGE, the mining engineer of Denver, Colo., is again in our midst. Mr. HARDINGE has made several visits to Southern California in the last few years.

THOR. F. VAN WAGENEN, F. M. E., has kindly consented to allow us the use of his article published in the *School of Mines Quarterly* on the System of the Location of Mining Districts. MR. VAN WAGENEN is a thorough metallurgist and is also an authority on hydraulic mining, being the author of *The Manual of Hydraulic Mining* for the practical miner. His article on the Location of Mining Districts is not a new theory by any means, having received the consideration of such eminent professional men as DR. R. W. RAYMOND, CLARENCE KING, J. F. KEMP and others. The article above referred to will be published in our issue of September 1st, and those interested in the geology of the country will do well to secure a copy of the JOURNAL and read it!

Quotations are per 100 lb from New York and vicinity as follows: Acetic acid, commercial, No. 8, \$1.40@1.50; muriatic acid, 18°, \$1.10@1.25; 20°, \$1.20@1.87½; 22°, \$1.35@2.25; according to quantity and brand. Nitric acid 36°, \$3.50@4.75; 38°, \$3.75@4.62½; 40°, \$4.40@4.87½; 42°, \$4.62½@5.25. Oxalic acid, \$6.50@6.75. Mixed acid, according to mixture. Sulphuric acid, 66°, \$1.10 for drums and \$1.15@1.75 for carboys. Chamber acid 50°, in jobbing way, \$11.50@12 per ton f. o. b. factory. Blue vitriol \$3.50@3.62½ for extra grades and \$3.37½ for ordinary.

BRIMSTONE.

We have again to record a quiet market, with prices about 50c. a ton lower than last week. Best unmined seconds can be had for \$21@21.50 a ton while thirds are sold at \$19@19.50.

MURIATE OF POTASH.

We quote per 100 lbs. on basis of 80 per cent., as follows: New York and Boston, \$1.78 for 80@85 per cent., and \$1.81c. for 95 per cent.; Norfolk and Philadelphia, \$1.76½ for 80@85 per cent., and \$1.79½ for 95 per cent.; Charleston, Savannah, Wilmington, N. C. and New Orleans, \$1.78½ for 80@85 per cent., and \$1.81½ for 95 per cent. All for lots of 50 tons and upward.

KALIN.

Invoice weights as taken at port of shipment per ton of 2,240 lbs. testing 12.4 per cent. actual potash, equivalent to 23 per cent. sulphate of potash, \$8.55 @ \$8.80 for New York and Boston; \$8.90 @ \$9.15 for Norfolk, and Philadelphia; and \$9.05@9.30 for Charleston. Sa-

vannah, Wilmington, N. C. and New Orleans.

NITRATE OF SODA.

Spot nitrate is in ample supply and buyers have the upper hand for the present. We have again to quote a little lower price, \$1.50@1.55 per 100 lbs. for spot. The same figures are quoted for futures, in view of the quantities known to be afloat for New York.

FINANCIAL NOTES.

The statement of the United States Treasury, on Thursday, July 28th, shows balances in excess of outstanding certificates as below, comparison being made with the statement for the corresponding date last week:

	July 28	Changes.
Gold.....	\$19,474,535 I.	\$2,266,292
Silver.....	13,747,199 I.	715,046
Legal Tenders.....	46,093,752 I.	1,618,490
Treas'y Notes, etc.....	4,095,106 I.	404,695
Totals.....	\$233,380,602 I.	\$5,063,833

Treasury deposits with national banks amounted to \$57,627,771, an increase of \$97,771 during this week.

Average Monthly Prices of Silver.

In New York per ounce Troy, from January 1st, 1898, and for the years 1897 and 1896:

Month	1898	1897	1896
	Cents.	Cents.	Cents.
January.....	56.77	64.79	67.13
February.....	56.07	64.67	67.67
March.....	54.90	63.06	68.40
April.....	56.02	61.85	67.92
May.....	56.98	60.42	67.78
June.....	58.61	60.10	68.69
July.....	59.06	59.61	68.75
August.....	—	54.19	67.34
September.....	—	55.24	65.68
October.....	—	57.57	66.03
November.....	—	57.91	64.93
December.....	—	58.01	65.24
Year.....	—	59.79	67.73

Gold and Silver Exports and Imports.

At all United States ports, June, 1898, and years from January 1st, 1898 and 1897:

	Coin and Bullion Exp.	Imp.	In Ores Exp.	Imp.
Gold—				
June.....	\$ 375,539	\$ 184,774	\$.....	\$145,838
1898.....	6,048,360	99,244,751	73,441	2,639,042
1897.....	25,000,717	3,715,249	93,188	2,229,314
Silver—				
June.....	4,156,650	799,755	1,229,048
1898.....	24,392,928	3,202,116	112,699	9,276,271
1897.....	27,894,900	4,419,889	259,159	10,606,491

This statement includes the exports and imports at all United States ports, the figures being furnished by the Bureau of Statistics of the Treasury Department.

Shipments of silver from London to the East for the year up to July 14th are reported by Messrs. Pixley & Abell's circular as below:

	1897	1898	Changes.
India.....	£2,847,700	£2,987,440	I. £139,740
China.....	109,942	354,140	I. 253,198
The Straits.....	106,405	150,769	I. 44,357
Totals.....	£3,055,047	£3,492,349	I. £437,295

The statement of the Bureau of Statistics for June puts the exports for that month at \$94,808,263, which is still a very high figure, while imports were \$51,267,591. For the fiscal year ending June 30th the statement is as follows:

	1897.	1898.
Exports.....	\$1,050,933,556	\$1,231,311,868
Imports.....	764,739,412	616,052,814
Excess, exports.....	\$286,263,144	\$615,259,024
Add excess of exports, silver.....	—	31,413,411
Total.....	—	\$646,672,435
Deduct excess of imports, gold.....	—	104,985,293
Net apparent balance.....	—	\$ 542,687,152

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Advertisements of this class containing not more than five lines will be inserted for not exceeding three months in any year, free of charge, to all paid-up annual subscribers. Other than above \$1.00 per month will be charged. Advertisements not accepted for less than one month.

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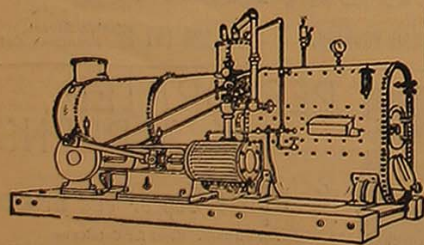
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MINING STOCK QUOTATIONS

BOSTON	
Aetna Con.	do. rights. 55
Albion	3 38
Anaconda	Gold Coin 1 00
Arnold	Humboldt 4 75
Ash Bed.	Illinois Steel 60 00
Atlantic	Lake Sup Iron —
Baltic	Merced —
Bonanza	National 75
Boston and C. C.	New Idria Mg —
Boston & Mont.	Old Dominion 28 00
Butte & Boston	Oscoda 55 25
Calumet & Hecla	Parrott 22 00
Catalpa	Pioneer 5 75
Centennial	Quincy 118 1/2
Centennial	San Isabel —
Dominion Coal	Tamarack 165 00
Dominion Pref.	Tecumseh 2 00
Franklin	Wolverine 23 00

NEW YORK.

Alamo	03 1/2	Homestake	28 50
Alice	40	Iron Silver	—
Annetta	45	Mexican	30
Best & Belcher	60	Mollie Gibson	19
Brumswick	05	Ontario	4 50
Bulwer	—	Ophir	—
Crown Point	65	Pharmacist	10
Con. Cal. & Va.	—	Plymouth	—
Cripple Creek Con	08 1/2	Quicksilver	3 00
Deadwood	—	Quicksilver pfd	11 00
Favorite	11 25	Sierra Nevada	—
Fortuna	04	Standard	1 60
Golden Fleece	45	Union Con	—
Gould & Curry	45	Yellow Jacket	—
Hale & Norcross	—	—	—

SAN FRANCISCO.

Alpha	—	Exchequer	—
Alta Con	10	Gould & Curry	21
Andes	09	Hale & Norcross	1 65
Belcher	23	Justice	55
Best & Belcher	27	Mexican	21
Bodie	—	Ophir	80
Bullion	10	Overman	—
Challenge	16	Potosi	21
Chollar	15	Savage	10
Confidence	85	Sierra Nevada	67
Con. Cal. & Va.	49	Union Con	11
Con New York	—	Utah	07
Crown Point	13	Yellow Jacket	30

COLORADO SPRINGS STOCKS

Alamo	02	Jack Pot	03 1/2
Anaconda	52 1/2	Lexington	—
Argentum Juanita	26	Lillie	80
Bob Lee	—	Magnet R	008 1/2
Creede & C. C.	08 1/2	Marion	—
C. C. Consolidated	09	Matos	15
Des Moines	—	Mollie Gibson	24 1/2
Elkton Con	93	Moon-A'ler	74 1/2
El Paso	07	Mount Rosa	12 1/2
Fanny R	16	New Haven	01 1/2
Favorite	—	Pharmacist	05
Fludley	03 1/2	Pilgrim C	—
Franklin	—	Portland	99 1/2
Golden Crater	—	Pr. Albert	01 1/2
Golden Fleece	30	Specimen	—
Gold & Globe	—	Theresa	—
Hayden	005	Trachyte	00 1/2
Ing. Con.	06 1/2	Union Gold	01 1/2
Isabella	23 1/2	Work	02 1/2

SALT LAKE CITY

Alice	70	Lucky Bill	—
Ajax	30	Malvern	—
Alliance	—	Mammoth	1 87 1/2
Anchor	20	Maxfield	—
Buckeye	02	Mercur	7 25
Bull, Beck	5 50	Morgan	—
Cent. Eureka	32	Northern Light	10
Chloride Point	96 1/2	Omaha	27 1/2
Dalton	00 1/2	Ontario	3 60
Daly	70	Overland	—
Daly West	3 50	Richmond Ana	—
Dalton & Lark	08	River	03 1/2
Dexter	1 02	Rover	—
Eagle	04	Sacramento	45
Eureka Hill	—	Silver King	18 50
Four Aces	04	Sioux Con	—
Galena	42	Sunbeam	—
Gemini	—	Sunshine	26 1/2
Geyser-Marion	77	Swansea	2 42 1/2
Grand Central	6 80	So Swansea	1 18 1/2
Homestake	00 1/2	Utah	60
Horn Silver	1 37 1/2	Utah Con	—
Little Pittsburg	01 1/2	Young America	57 1/2

ROSSLAND, BRITISH COLUMBIA.

Alberta	05	Josie Mac	12 1/2
B. C. Gold King	07	Josie	38
Beaver	10	Jumbo	75
Big Three	10	Knight Templar	10
Bluebird	07	Kootenay-London	10
Butte	10	Le Roi	00
California	05 1/2	Lilly May	13
Caledonia Con	05 1/2	Mabel	15
Colonia	15	Mayflower	10
Camp Bird	05	Monita	18
Celtic Queen	05	Monte Christo	19 1/2
Centre Star	—	Morning Star	03
Colonna	24	Mugwump	03
Commander	18	Nest Egg	05
Deer Park	12 1/2	Northern Belle	10
Della Colla	02	Novelty	09
Delaware	12	O. K.	10
Eastern Star	20	Palo Alto	05
Enterprise	20	Phoenix	13 1/2
Eric	03 1/2	Poorman	10
Eureka Con	05 1/2	R. E. Lee	15
Evening Star	08 1/2	Red Eagle	06
Georgia	10 1/2	Red Mount. View	10
Gertrude	10 1/2	Red Point	10
Golden Drip	15	Ross'd H'mest'ke	05
Good Hope	03 1/2	Rossland, Red Mt.	20
Grand Price	03 1/2	St. Elmo	05
Great Western	08	St. Paul	12 1/2
Hattie Brown	—	Silver Bell	04
Helen	04	Silverline	06
High Ore	04 1/2	So. Cross & W. Con	20
Imperial	10	Virginia	12
Iron Horse	20	War Eagle Con	1 00
Iron Mask	38	West Le Roi	—
I. X. L.	10	White Bear	11

DENVER STOCK REPORT.

Aetna	001 1/2	Keystone	04
Anaconda	51	Lillie	90
Arcadia	00 1/2	Moon A.	76
Argentum Junita	25	Mc. Rosa	12 1/2
Banner	07	Old Gold	06 1/2
Bob Lee	002 1/2	Peoples	01 1/2
C. C. Con	003 1/2	Pilgrim C	002 1/2
Elkton	90 1/2	Pine Creek	002 1/2
El Paso G	05 1/2	Portland	—
Enterprise	02 1/2	Prince Albert	01 1/2
Garfield Group	05	Republic	02 1/2
Geo. Washington	003 1/2	Sacramento	02 1/2
Golden Eagle	34	Specimen	03
Gold Coin	38	Tamarack	004 1/2
Gilpin & C. C.	08 1/2	Union Gold	10 1/2
Gilpin Four	004 1/2	Virginia M	03 1/2

Iron Clad	02 1/2	Wheel of Fortune	002 1/2
Isabella	23 1/2	Work	02 1/2
Jack Pot	03 1/2	—	—

MEXICO

Name of Company	State	Price
Alianza	Hidalgo	5
Amistad y Concordia	"	24
Angustias	Guanajuato	360
Arevalo y Anexas	Hidalgo	240
Asturiana y Anexas	Zacatecas	170
Barradon y Cabras	Durango	150
Bartolome de Medina	Hidalgo	160
Cabezon y An	Zacatecas	30
Candelaria de Pinos	"	160
Capazaya	Durango	120
Carmen	Hidalgo	460
Castellana y San Ram	Tepec	25
Cerro Colorado	Chihuahua	10
Cinco Senores y An	Guanajuato	480
Concepcion y Anexas	S. Luis Potosi	100
El Oro	Guanajuato	40
Esparanza y An	Mexico	1,300
Guadalupe	Guanajuato	180
Huautla	Santa Ana	100
Luz de Borda	Michoacan	100
Luz de Maravillas	Hidalgo	100
Pabellon	"	150
Palma	Zacatecas	100
Purisma de los Com	"	5
Real del Monte	Hidalgo	900
Refugio y Va	"	3
Restauradora	Durango	60
San Francisco	Hidalgo	270
S. Ped. Chalchihuites	"	12
San Rafael y Anexas	"	925
do. Free Stock	"	400
San Rafael del Oro	Hidalgo	20
Sta. Maria de la Paz	S. Luis Potosi	650
Sirena	Durango	50
Soledad	Hidalgo	500
Sorpres	"	250
Trinidad	Guanajuato	40
Union	Puebla	27
Zomelahuacan (gold)	Hidalgo	280
Zona Min. de Pozos	Vera Cruz	100
	Guanajuato	15

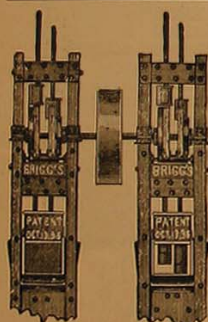
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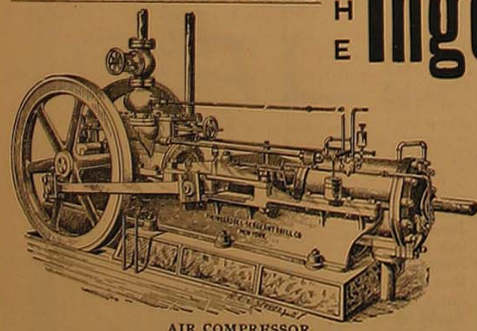
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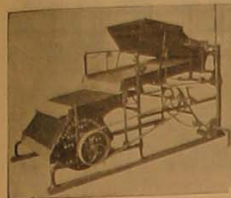


ROCK DRILLING

INCORPORATED MINES PAYING DIVIDENDS.

	NAMES OF MINES	LOCATION	No. of Shares	Capital Stock	Par Value	Amount of last Dividend	Date of Last Dividend	Total Amount Paid in Dividends	Kind of Mineral Produced
1	Aetna Cons.	California	100,000	\$ 500,000	\$ 5	\$ 10	July 1898	\$ 140,000	Q.
2	Ajax	Utah	300,000	3,000,000	10	10	October, 1897	1,000,000	G, C, S, L.
3	Alaska, Treadwell	Alaska	200,000	5,000,000	25	35 1/2	Oct., 1897	3,250,000	G.
4	Alaska Mexican	Alaska	200,000	1,000,000	5	10	Oct., 1897	297,031	G.
5	Alice	Montana	400,000	10,000,000	25	05	April 1898	1,075,000	G.
6	Alice	Utah	400,000	10,000,000	25	05	April 1898	1,075,000	S, L, G.
7	Anaconda	Montana	1,200,000	30,000,000	25	1 25	May 1898	6,750,000	C.
8	Anchoria Leland	Colorado	600,000	600,000	1	01	July 1898	144,000	G.
9	American Gold	Colorado	300,000	3,000,000	10	02	Mar 1898	291,000	G, S, L.
10	Atlantic	Michigan	40,000	1,000,000	25	1 00	Feb. 1897	740,000	S.
11	Bald Butte	Montana	250,000	250,000	1	03	Sept 1897	512,500	G, C, S.
12	Bangkok C-Bell	Colorado	600,000	600,000	1	01	July 1898	107,510	S, L, C.
13	Big Six	Colorado	500,000	500,000	1	00 1/2	May 1898	15,000	G, S.
14	Boston & Montana	Montana	150,000	3,750,000	25	3 00	May 1898	7,625,000	G, C, S.
15	Bullion Beck and Champion	Utah	100,000	1,000,000	10	50	Mar 1897	2,485,000	G, S.
16	Bunker Hill and S	Idaho	300,000	3,000,000	10	05	Oct 1897	324,000	S, L.
17	Cariboo	British Col.	800,000	800,000	1	02	May 1897	158,965	G.
18	Calumet & Hecla	Michigan	10,000	2,500,000	25	10 00	Oct 1897	50,850,000	C.
19	Centennial Eureka	Utah	30,000	1,500,000	50	1 00	Mar 1897	2,010,000	S, L.
20	Central Lead	Missouri	4,000	400,000	100	1 00	O. t 1897	16,000	L.
21	Charleston	South Car.	10,000	1,000,000	100	1 00	Feb 1897	150,000	G.
22	Champion	California	34,000	340,000	10	25	April 1898	296,200	G.
23	Chloride Point	Utah	500,000	500,000	1	01	Dec. 1897	5,000	G, S.
24	Colorado Sun	Montana	100,000	1,000,000	10	50	June 1898	1,595,000	G, S, C.
25	Crescent	Utah	24,000	600,000	25	25	July 1897	280,000	S, L.
26	Daly	Utah	150,000	3,000,000	20	25	Mar 1897	2,925,000	G.
27	Deadwood Terra	Dakota	200,000	5,000,000	25	40	June 1897	1,320,000	S, L.
28	De Lamar	Idaho	400,000	2,000,000	5	25	Jan 1897	2,250,100	G.
29	Della S.	Colorado	1,000,000	1,000,000	1	10	Jan 1897	60,000	S, L.
30	Doe Run	Missouri	5,000	500,000	100	50	October 1897	12,093	G.
31	Elkton Consolidated	Colorado	1,250,000	1,250,000	1	01 1/2	July 1898	555,710	G, S.
32	El Paso	Colorado	650,000	650,000	1	01	Jan 1893	1,850,000	G, S.
33	Eureka Hill	Utah	10,000	1,000,000	100	100	1897	132,530	S.
34	Florence	Montana	500,000	2,500,000	5	01	May 1897	500,000	G.
35	Gemini	Utah	5,000	500,000	100	100	1897	84,000	G.
36	Geyser-Marion	Utah	300,000	1,500,000	5	02	May 1898	80,000	G.
37	Gold Coin of Victor	Colorado	1,000,000	1,000,000	1	01	June 1898	150,000	G.
38	Golden Cycle	Colorado	21,000	1,000,000	5	00 1/2	June 18 8	160,000	G, S.
39	Gold Coin	Colorado	200,000	1,000,000	5	05	Nov 1897	51,625	G.
40	Gold and Globe	Colorado	750,000	750,000	1	3-10	July 1897	2,175,000	S, G, L, C.
41	Hecla Consolidated	Montana	30,000	1,500,000	50	50	Feb 1897	475,000	S, L.
42	Helena & Frisco	Idaho	500,000	2,500,000	5	04	August 1896	3,424,978	G.
43	Highland	S. Dakota	100,000	10,000,000	100	20	Oct 1897	18,000	G.
44	Holy Terror	S. Dakota	300,000	300,000	1	03	Sept 1897	6,431,250	G.
45	Homestake	S. Dakota	125,000	12,500,000	100	25	Oct 1897	762,252	S, L.
46	Hope	Montana	100,000	1,000,000	10	10	Mar 1893	5,120,000	G.
47	Horn Silver	Utah	400,000	10,000,000	25	05	April 1898	152,000	G.
48	Idaho	Brit. Col.	500,000	500,000	1	05	Mar 1887	90,000	G.
49	Iowa	Colorado	1,000,000	1,000,000	1	00 1/2	June 1898	501,100	G.
50	Iron Mountain	Montana	500,000	5,000,000	10	1 00	Jan 1898	270,000	G.
51	Isabella	Colorado	2,250,000	2,250,000	1	00 1/2	June 1897	160,000	S, L.
52	Kearsarge	Michigan	40,000	1,000,000	25	10	Aug 1897	625,000	G.
53	Last Chance	Brit. Col.	500,000	500,000	1	04	Jan 1897	99,100	G.
54	Le Roi	British Col.	500,000	2,500,000	5	10	Oct 1897	3,240,000	G.
55	Lillie	Colorado	1,000,000	1,000,000	1	01	July 1898	2,997,557	G, S.
56	Minnesota	Minnesota	165,000	16,500,000	100	1 50	July 1896	666,600	G.
57	Montana Ltd	Montana	660,000	3,300,000	5	05 1/2	May 1898	60,000	G.
58	Montana Ore Purchasing	Montana	40,000	1,000,000	25	1 00	July 1898	1,066,000	G.
59	Morning Star	California	2,400	240,000	100	5 00	June 1898	1,250,000	G, S, C, L.
60	Mt. Rosa	Colorado	1,000,000	1,000,000	1	02	Jan 1898	216,000	G.
61	Mercur	Utah	200,000	5,000,000	25	18	May 1898	72,000	G.
62	Mammoth	Utah	400,000	10,000,000	25	05	June 1898	832,500	S, G.
63	Moon Anchor Gold	Colorado	600,000	600,000	1	07 1/2	July 1898	930,000	Q.
64	New Elkhorn	Colorado	300,000	1,500,000	5	24	Sep. 1896	60,000	Q.
65	New York & Hon. Rosario	Central A.	150,000	1,500,000	10	10	Oct. 1897	13,542,500	S, L.
66	Napa	California	100,000	700,000	7	20	July 1898	2,172,500	C.
67	New Idria Quicksilver	California	100,000	500,000	5	10	July 1898	2,000,898	G.
68	Ontario	Utah	150,000	15,000,000	100	75	Dec. 1897	38,775	G, S.
69	Osceola	Michigan	50,000	1,250,000	25	1 00	June 1897	1,492,898	G.
70	Parrot	Montana	230,000	2,300,000	10	30	July 1898	405,000	G.
71	Pennsylvania Consolidated	California	51,500	5,150,000	10	05	June 1898	9,470,000	C.
72	Portland	Colorado	3,000,000	3,000,000	1	01 1/2	June 1898	24,000	L.
73	Princess	Colorado	1,000,000	1,000,000	1	00 1/2	Feb 1897	1,575,000	S, L, G.
74	Quincy	Idaho	100,000	2,500,000	25	4 00	August 1897	350,000	G.
75	Rambler-Cariboo	Brit. Col.	1,000,000	1,000,000	1	02	April 1897	1,035,000	S, L, Z.
76	Raven	Colorado	1,500,000	1,500,000	1	01	March 1898	150,000	G, S.
77	Reco	Brit. Col.	1,000,000	1,000,000	1	50 1/2	May 1897	100,000	S, L.
78	Sacramento	Utah	1,000,000	5,000,000	5	00 1/2	June 1898	600,000	G.
79	Santa Rosalia	California	100,000	100,000	1	10	Feb. 1898	4,950,000	C.
80	Small Hopes Consolidated	Colorado	250,000	5,000,000	20	10	June 1898	73,000	S.
81	South Swansea	Utah	150,000	150,000	1	05	April 1898	177,000	G, S.
82	Standard	California	200,000	20,000,000	100	10	Mar 1898	3,010	S, L.
83	St. Joseph	Missouri	250,000	2,500,000	10	15	Oct 1897	955,000	G.
84	Silver King	Utah	150,000	3,000,000	20	25	June 1898	76,125	G.
85	Slocan Star	Brit. Col.	2,000,000	1,000,000	0.50	05	Mar 1897	48,680	G.
86	Smuggler	Colorado	1,000,000	1,000,000	1	01	June 1898	187,000	G.
87	Smuggler Union	Colorado	50,000	5,000,000	100	1.00	Oct 1896	187,000	G.
88	Swansea	Utah	100,000	500,000	5	05	June 1898	100,000	S, L.
89	Tom Boy	Colorado	200,000	2,000,000	10	10	Dec 1896	600,000	G.
90	Tamarack	Michigan	60,000	1,500,000	15	3 00	June 1897	4,950,000	C.
91	Union	Colorado	1,250,000	1,250,000	1	01	June 1896	73,000	S.
92	Utah	Utah	100,000	1,000,000	20	01	Dec. 1897	177,000	G, S.
93	Utah Consolidated	Utah	30,000	150,000	5	02	Sept. 1896	3,010	S, L.
94	Victor	Colorado	200,000	1,000,000	5	50	June 1898	955,000	G.
95	Vindicator	Colorado	1,500,000	1,500,000	1	05	July 1898	76,125	G.
96	Western Mine Enterprise	Montana	500,000	500,000	1	20	Jan 1898	48,680	G.
97	War Eagle	British Col.	500,000	500,000	1	08	October 1896	187,000	G.

S, Silver. G, Gold. L, Lead. C, Copper. Q, Quicksilver. I, Iron. Z, Zinc.

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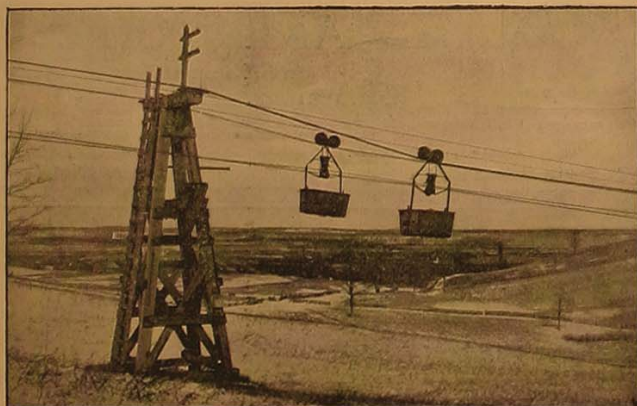
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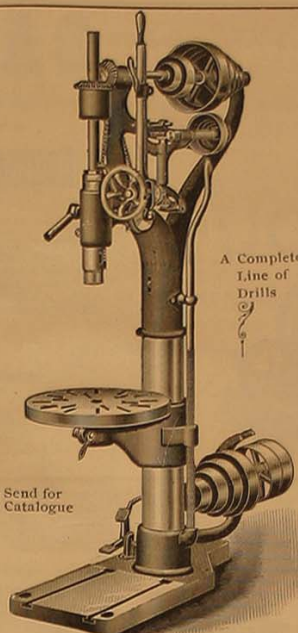
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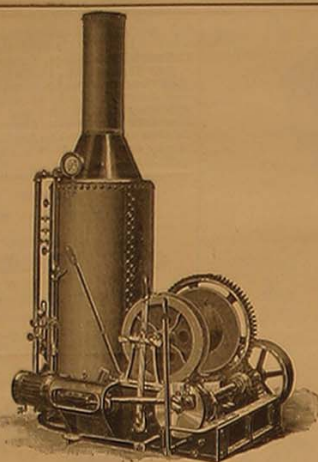
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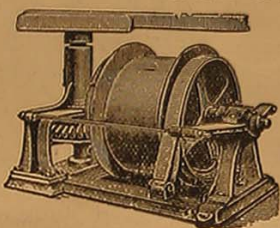
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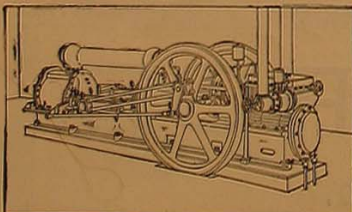
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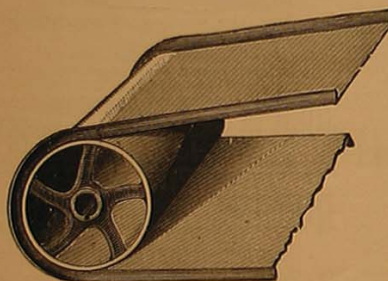
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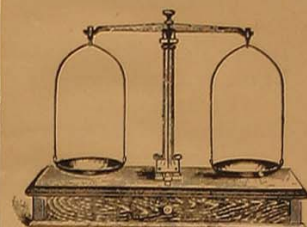
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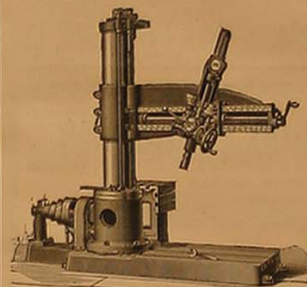
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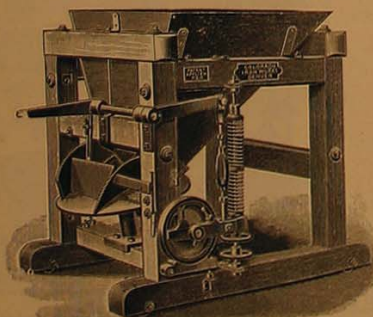
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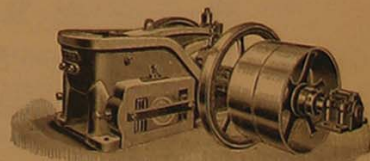
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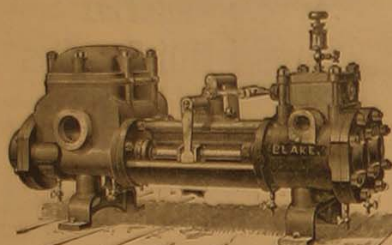
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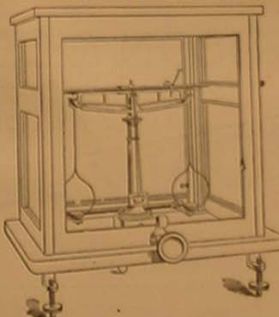
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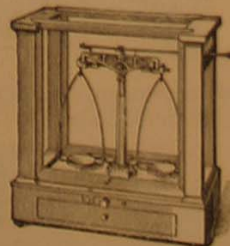
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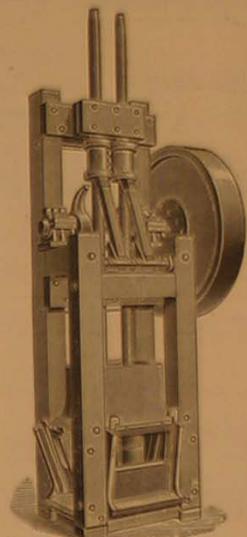
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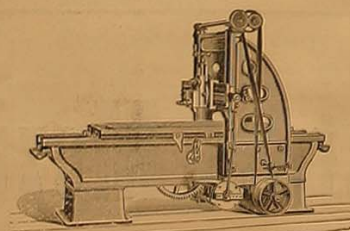
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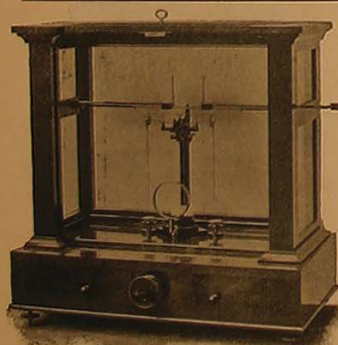
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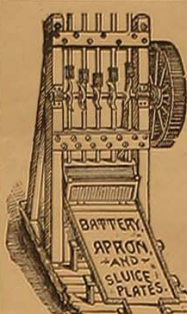
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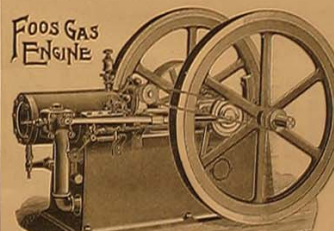
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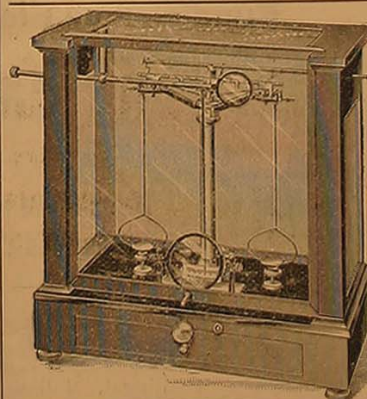
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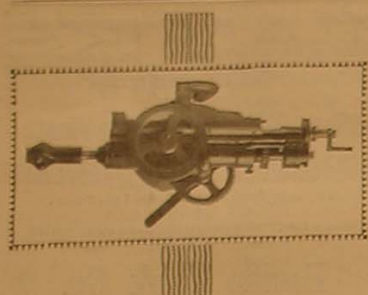
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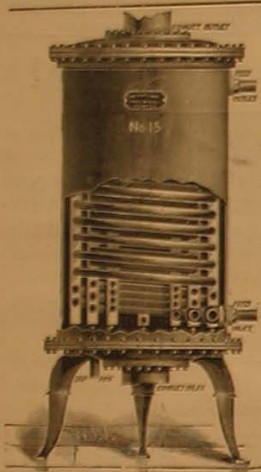
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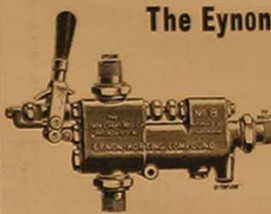
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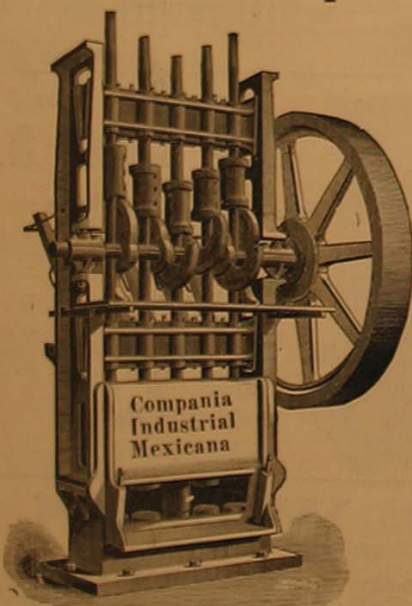
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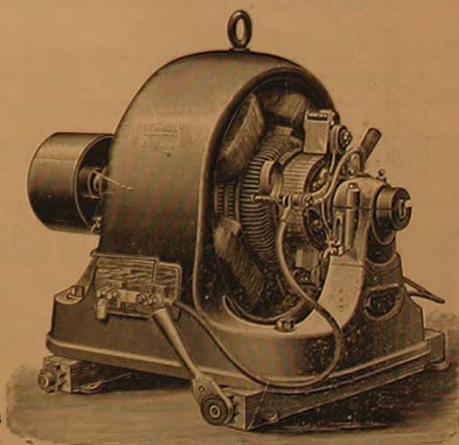
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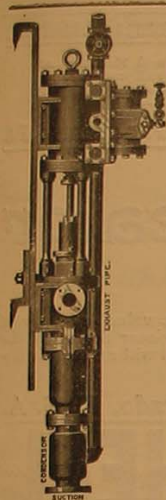
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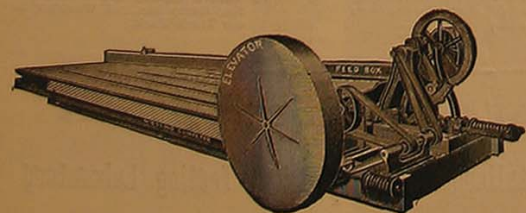
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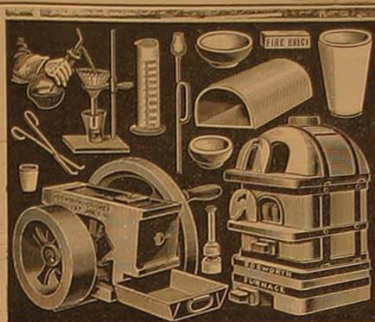


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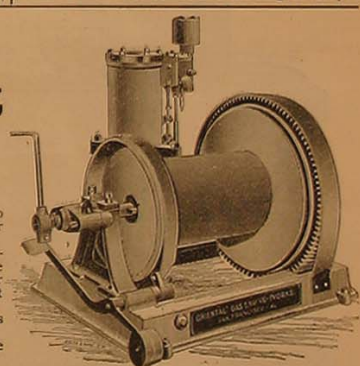
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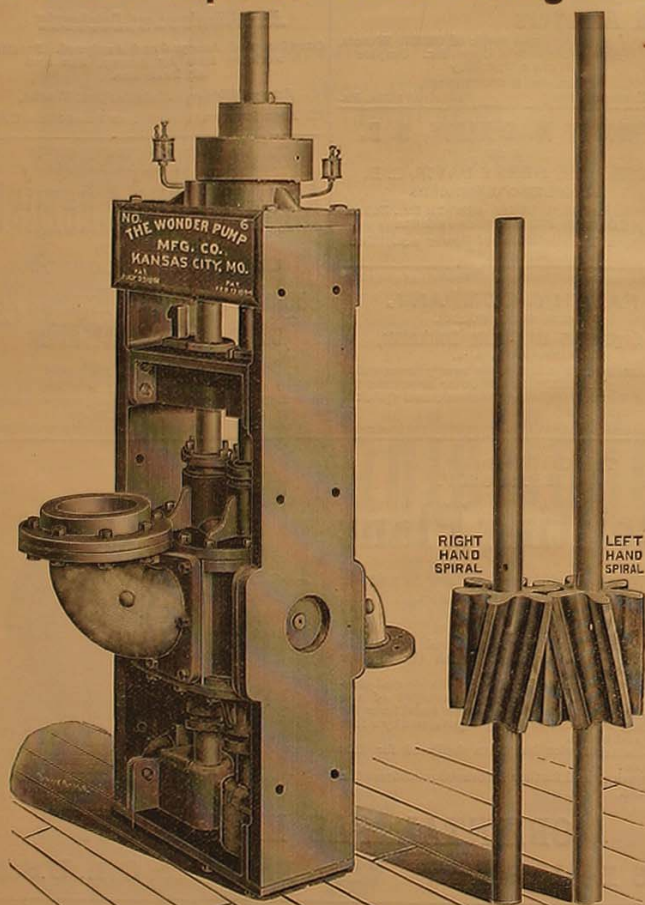
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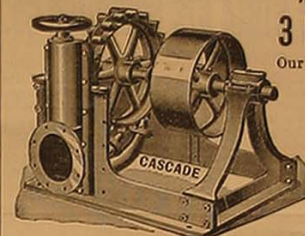
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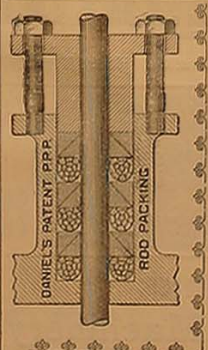
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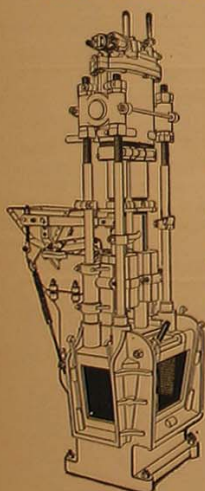
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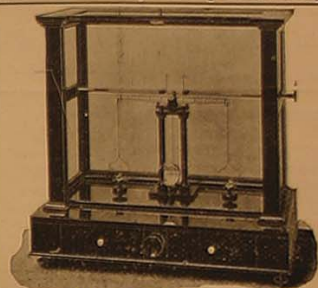
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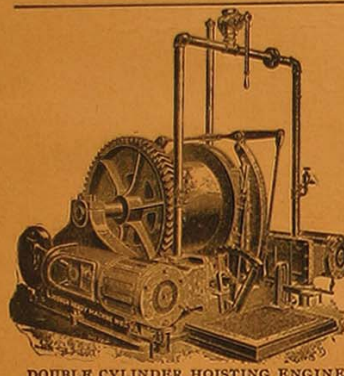
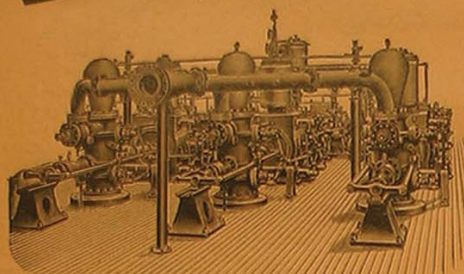
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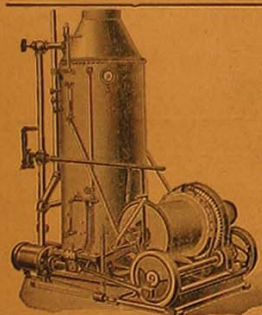
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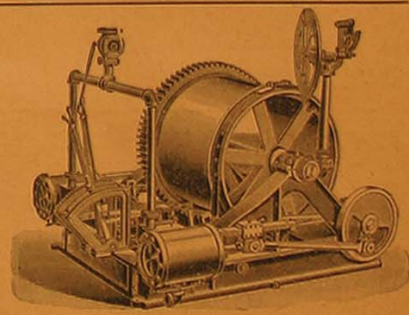
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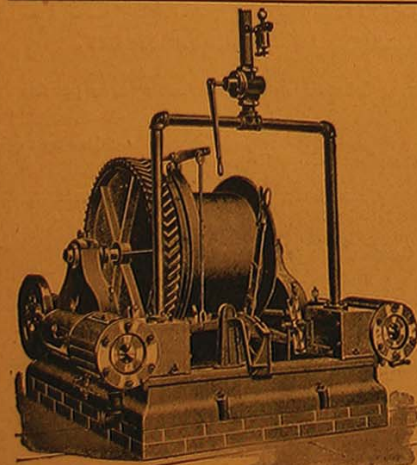
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